USDA NRCS
Natural Resources Conservation Service

Resource Assessment

and

Trends

in the Midwest Region

March 2001

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Foreword

This report has been prepared by Natural Resources Conservation Service as both a resource document and educational tool. It has been produced to convey information about the condition of natural resources on private lands, agricultural production, and producers in the Midwest Region. The report identifies changes and trends that may impact critical conservation issues in the near future.

The findings and predictions are stated in the three chapters:

Strategic Trends in the Midwest Region;

Natural Resource Issues in the Midwest Region; and

Basins of National Importance in the Midwest Region.

Healthy natural resources are critical to support the lives of over 57 million people who live in the Midwest Region.

I am very pleased to present the information you will find in this report, "Resource Assessment and Trends of the Midwest Region." This report has been prepared as a resource document and educational tool. It conveys information about the condition of the natural resources on private lands and about agriculture in the Midwest Region.

The primary business of Natural Resources Conservation Service is providing technical assistance to farmers and ranchers that own and/or operate businesses that have an impact upon the natural resources. Our workforce consists of both paid employees and non-paid volunteers, all of whom are dedicated to conserving the natural resources of our great country.

We have invested in building an infrastructure that moves people to understand natural resources and then to want to voluntarily participate in conservation efforts. Our offering of technical assistance is made through our locally-led conservation delivery system, available in every county to individuals, tribal and other governments, and organizations.

I hope that you find the information in this report to be useful. We would appreciate your comments so that we can continue to provide you with the information that you need to make the right decisions about natural resources.

Charles Whitmore
Regional Conservationist
Midwest Region
Natural Resources Conservation Service
U.S. Department of Agriculture

Introduction to the Midwest Region

The Midwestern United States is called the "Cornerstone of American Agriculture." The Midwest Region includes the states of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. These eight states encompass about 458,000 square miles. The population in the region is over 57 million, of which 72 percent is considered urban and 28 percent is rural. The landscape, natural resources, and human population of the region are as diverse as any other region in the United States.

The region's landscape varies from its rich cropland to its productive hardwood forests, valuable wetlands, grazing lands, lakes and rivers. Annual rainfall varies from 20 inches in Minnesota to 50 inches in Missouri. This varied landscape and climate supports a diversity of ecosystems. Agricultural land in the region supports production of crops and livestock. The region accounts for large portions of the nation's agricultural production.

- 66 percent of corn production
- 70 percent of soybean production
- 25 percent of hay acreage
- 12 percent of vegetable crop production
- 59 percent of swine inventory
- 34 percent of dairy cattle inventory
- 16 percent of poultry production

Because land and water sustain our region's agricultural bounty and economic strength, they must be treated as valuable commodities. Healthy soils, clean air and water, abundant wildlife habitat, and scenic landscapes are important environmental commodities that provide significant benefits to society. These public benefits are gained as a result of private landowners engaging in a cooperative effort to practice good stewardship and to use their land according to its capabilities.

The USDA NRCS mission encompasses total resource protection: *helping people to conserve all natural resources on private lands.* This mission is accomplished in the region through hundreds of local soil and water conservation districts, as well as many other organizations.

The eight states in the Midwest Region encompass about 458,000 square miles with a total population over 57 million people.

Natural Resources Conservation Service

Who We Are, What We Do

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), was created in 1935 to help farmers and ranchers care for privately owned land. The Soil Conservation Act of 1935 charged SCS to deliver conservation assistance to farmers, ranchers, and other private landowners. This act put in place a remarkable federal, state, and local government partnership for delivering conservation assistance. This partnership still exists and functions today with NRCS and state and local conservation districts working together to address local natural resource priorities.

The strength of NRCS is in its workforce. Most of its employees serve in USDA's network of local, county-based offices. The rest are at state, regional, and national offices, providing technology, policy, and administrative support.

NRCS employees have the technical expertise and field experience to help land users solve their natural resource challenges and maintain and improve their economic viability. Nearly three-fourths of the technical assistance provided by the agency goes to helping farmers and ranchers develop conservation systems uniquely suited to their land and individual ways of doing business. The agency also provides assistance to rural and urban communities to reduce erosion, conserve water, and solve other resource problems.

NRCS employees are committed to working with private landowners and managers to assess the state of their land and protect its values.

The public financial commitment to conservation assistance has diminished measurably since the 1930s. In 1937, Congress appropriated $440 million in financial assistance through a new Agriculture Conservation Program and $23 million in technical assistance through SCS for conservation. Today, we would spend nearly $5 billion (current dollars) to share the cost of conservation, if we were to match the 1937 spending level.

NRCS provides assistance to private landowners to help them protect natural resources.

Conservation Technical Assistance (CTA) - provides technical assistance to land users, communities, and units of government in planning and installing practices. The purpose of the systems are to reduce erosion, improve soil and water quality, improve conservation wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.

Support for Natural Resource Conservation on the Land

The NRCS organization in the Midwest Region consists of a Regional Office located in Madison, Wisconsin; eight state offices; and 652 field offices. All offices work with state, tribal, and local conservation partners and other natural resource agencies.

Field Offices

There are 652 field offices in the Midwest Region. Each field office is under the direction and supervision of a district conservationist/team leader who is responsible for NRCS activities in the geographical area served by the field office. The office boundary may include one or more conservation districts and one or more counties. Field offices are generally collocated in USDA Service Centers.

State Offices

There are eight state offices in the region, one in each state. Each state office is under the direction and supervision of a State Conservationist, who is responsible for NRCS programs in his or her state. The state office staffs include technical experts and an administrative support unit. Their purpose is to support the field level in the accomplishment of their work.

Regional Office

The Regional Office is under the direction and supervision of a Regional Conservationist. The Regional Conservationist is an extension of the Chief of the Agency and is responsible for:

1. Providing agency leadership, guidance, coordination, and partnering for solutions to regional resource issues;
2. Program implementation, consistency, and accountability;
3. Regionwide strategic planning, performance measurement, and operations management;
4. Administrative operations and support;
5. Fund integrity and accountability;
6. Technical quality of work; and
7. All NRCS activities in the region.

For information on conservation and programs in the Midwest Region, see the Midwest Regional Office web site at:

www.mw.nrcs.usda.gov

Strategic Trends in the Midwest Region

This chapter describes the density and size of farms, the tenure and gender of farm operators, and the organizational structure of farm businesses.

Structure of Agriculture

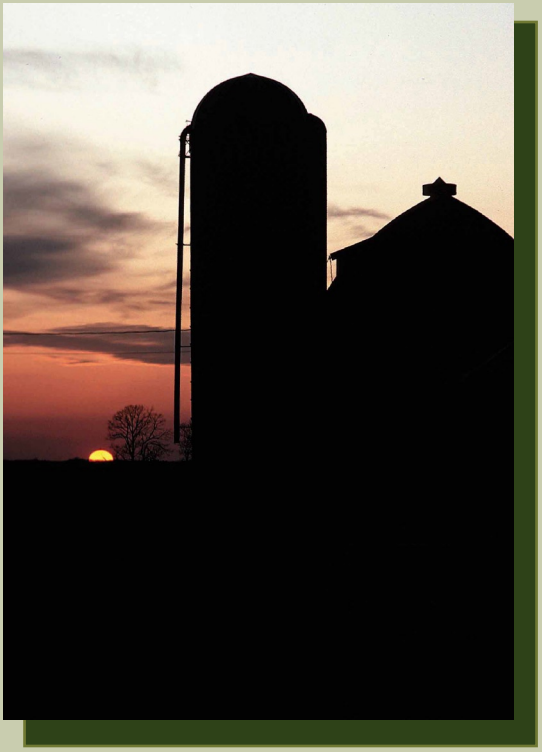
This section discusses the structure changes in agriculture

The structure of agriculture has changed greatly over the last few decades. The traditional "family farm" has transformed into a diverse and complex business operation that is impacted by everything from environmental laws and permits to global agricultural production and marketing. The make-up of today's agricultural producers also impacts their decision making and the opportunity for natural resources conservation. To adequately address the needs of farm businesses, NRCS and conservation partners are striving to better understand the trends of key components that impact today's agriculture. These trends can be used as a guide for determining customer assistance strategies and initiatives.

When considering how the structure of agriculture has changed over time, one could conclude that the region influences this structure more than any other region of the country. More than 30 percent of all the nation's farms are located in the eight states that comprise the region. In 1997, these farms had annual sales of more than $53 billion, which represents 30 percent of the national market value of all agriculture products sold.

The information in this section is intended to give insights into how agriculture has changed in the region over time, as compared to the rest of the nation, and how these trends may impact the future.

The Midwest Region significantly impacts today's agricultural production, with 30 percent of the nation's farms producing over $53 billion of agricultural products annually.



Farms and Farm Operators

Number of Farms

Historically, more than 30 percent of farms in the Nation have been located in the Midwest Region. This trend has been slowly declining. In 1997, there were 574,000 farms in the region. These farms encompass 168 million acres or 18 percent of the nation's total land in farms. (see figure 1)

Since 1978, the total number of farms has declined by 184,000 in the region. This represents a 24 percent decrease. Even with the annual decrease slowing since 1992, we still continue to lose over 4,200 farms annually. This trend indicates that current agricultural production in the region comes from about one-fourth fewer farms than 20 years ago. Even with these declines, each of the region's 652 NRCS field offices have an average of 900 farms to assist with conservation planning and natural resources protection. NRCS and conservation partners will need to position their workforce and resources to best meet the needs of these changing farm operations.

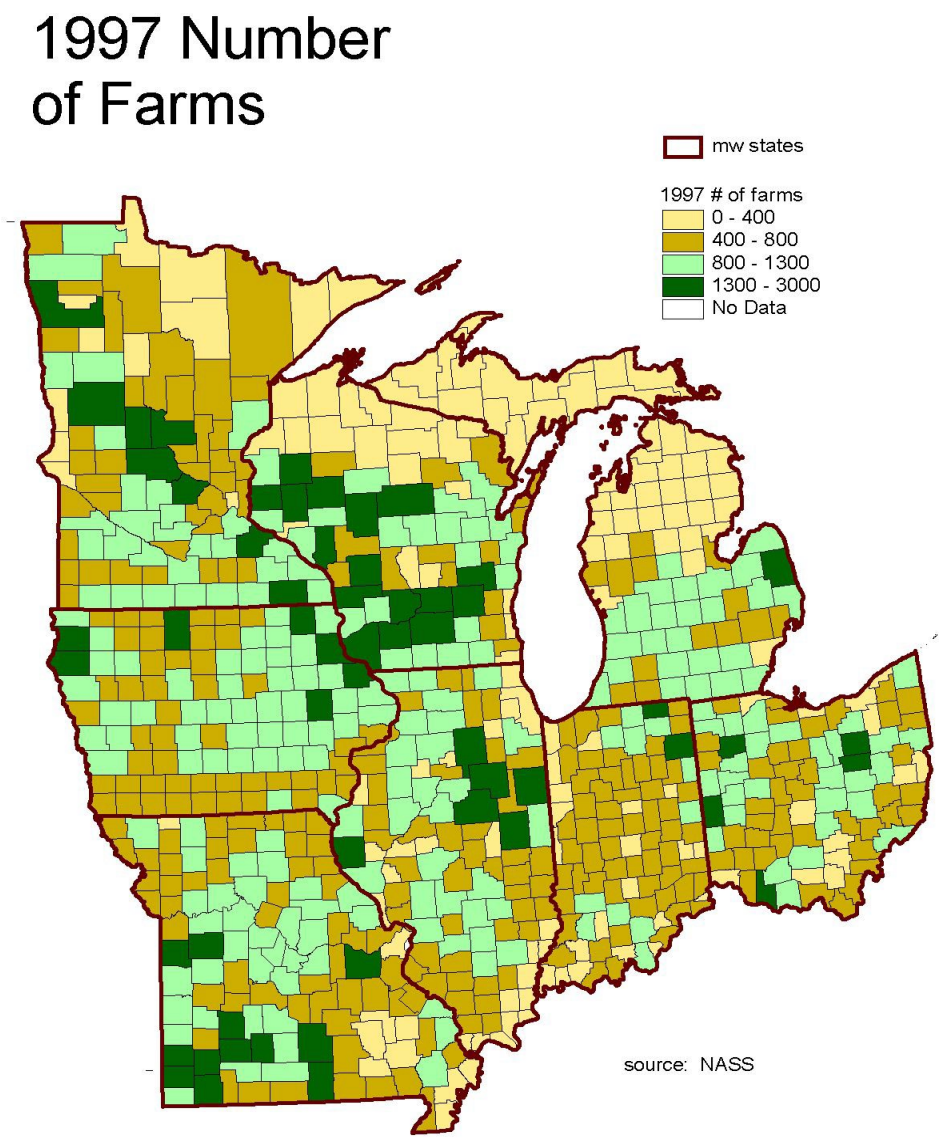


Figure 1

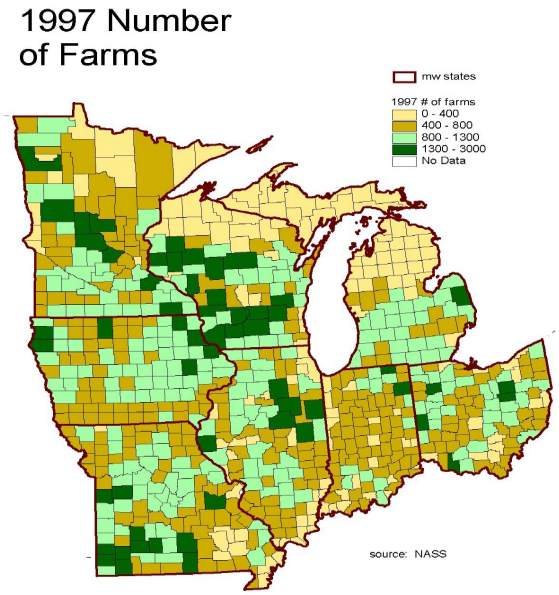
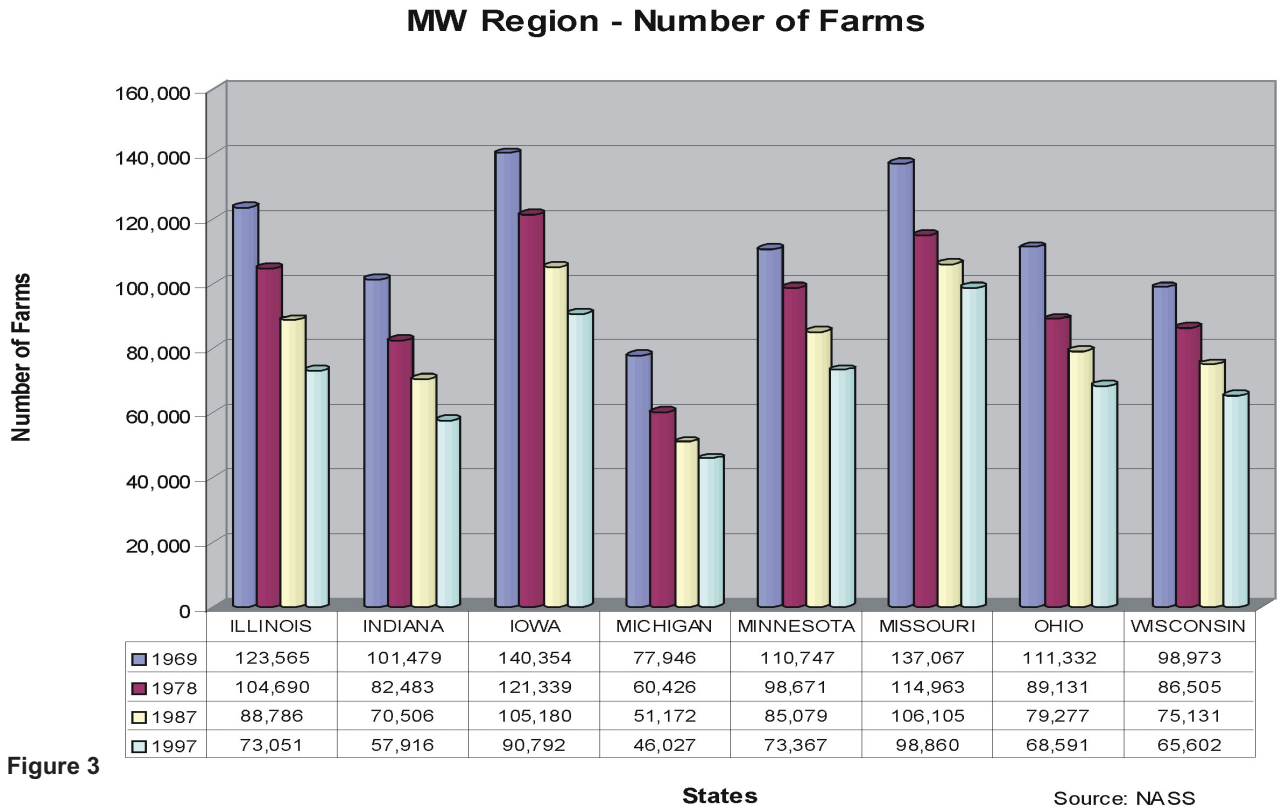


Figure 2 Source: NASS

Each of the region's 652 NRCS field offices have an average of 900 farms to assist with conservation planning and natural resources protection. (see figure 2)

The number of farms in the region has declined at different rates over time. From 1987-1997, there was a 13.5 percent reduction of the number of farms, the smallest decline since 1969-1978. (see figure 3)



	ILLINOIS	INDIANA	IOWA	MICHIGAN	MINNESOTA	MISSOURI	OHIO	WISCONSIN
1969	123,565	101,479	140,354	77,946	110,747	137,067	111,332	98,973
1978	104,690	82,483	121,339	60,426	98,671	114,963	89,131	86,505
1987	88,786	70,506	105,180	51,172	85,079	106,105	79,277	75,131
1997	73,051	57,916	90,792	46,027	73,367	98,860	68,591	65,602

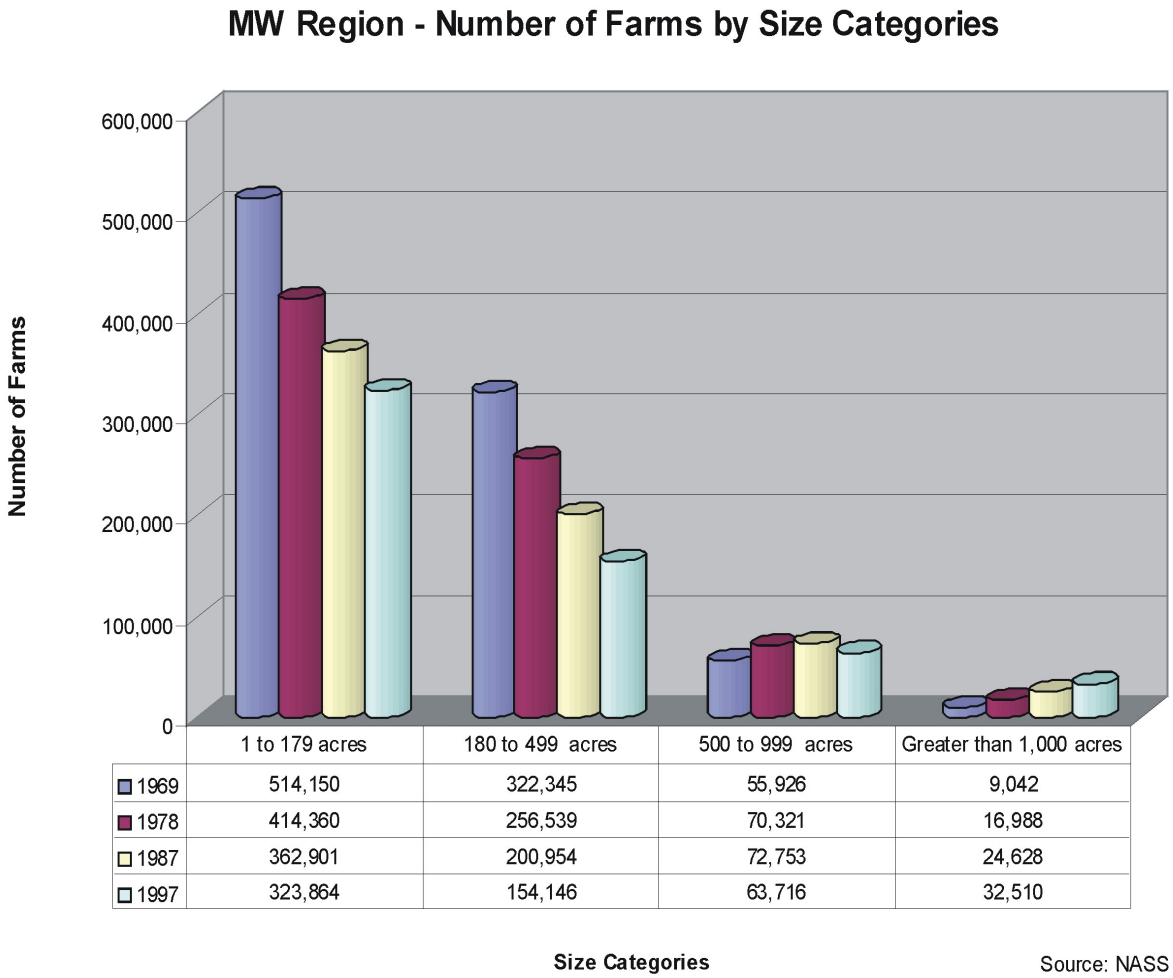
Figure 3 Source: NASS

Farm Size by Acres

The number of farms in the Midwest Region that are fewer than 500 acres has decreased significantly over the last 30 years. During this same period, the number of farms between 500 and 1,000 acres increased moderately. However, the number of farms with more than 1,000 acres has nearly quadrupled since 1969. In 1997, farms over 1,000 acres in size represented about 6 percent of the region's farms. (see figure 4)

This trend indicates that the average farm size in the region has increased to more than 290 acres. This represents a 38 percent increase since 1969. In 1997, the average farm size ranged from a high of 372 acres in Illinois to a low of 206 acres in Ohio.

The trend toward farms with more than 1,000 acres is expected to continue as a result of population increases, agricultural land being threatened by conversion to other land uses, and the farm economy driving small farmers out of the agricultural industry.



	1 to 179 acres	180 to 499 acres	500 to 999 acres	Greater than 1,000 acres
1969	514,150	322,345	55,926	9,042
1978	414,360	256,539	70,321	16,988
1987	362,901	200,954	72,753	24,628
1997	323,864	154,146	63,716	32,510

Source: NASS

Figure 4

Farm Size by Sales

The market value of products sold is another component to measure farm size. The number of farms with more than $100,000 of annual sales has increased by more than 60 percent since 1978. These large farms comprise 23 percent of all the Midwest Region farm operations. However, in 1997, these large farms generated more than 83 percent of the total value of agricultural sales in the region. On the other end of the scale, small farms with less than $10,000 in annual sales have declined since 1978. However, this group has increased 8 percent from 1992-1997. This trend will most likely continue with the expansion of small part-time operators that generate lower volumes of sales. (see figure 5)

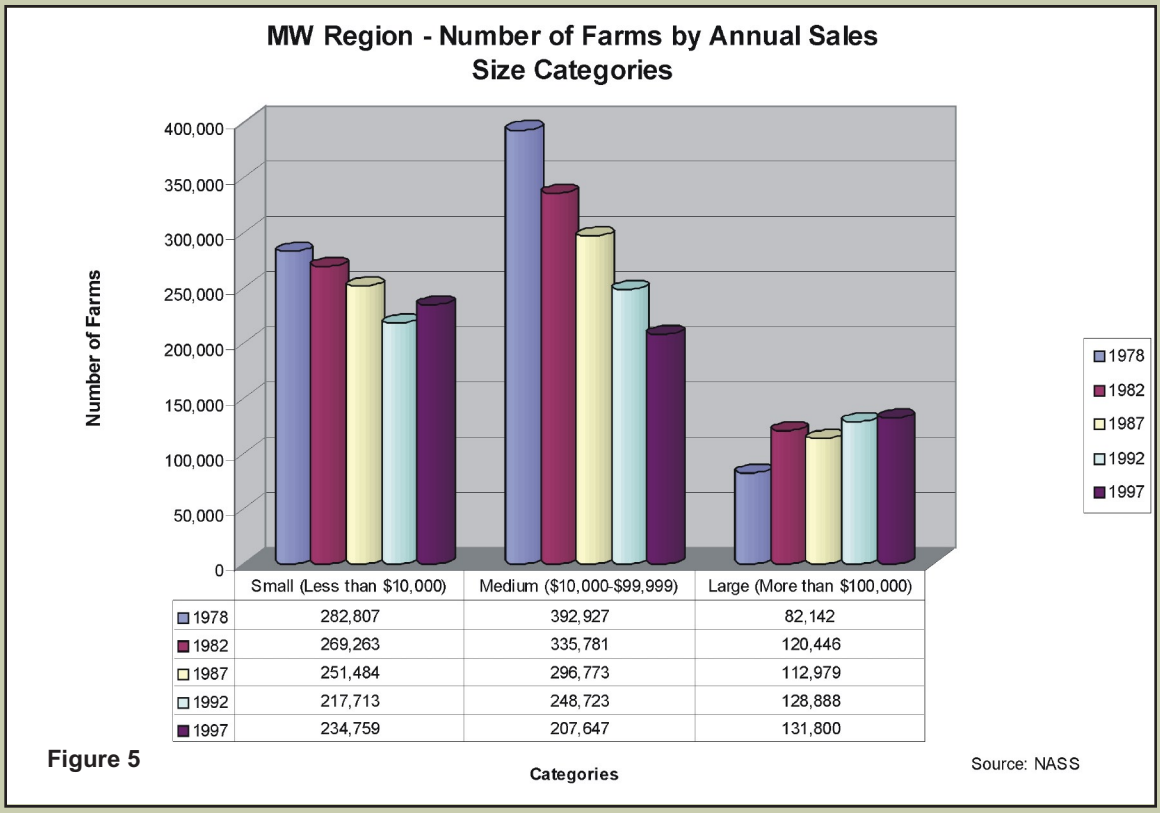


Figure 5

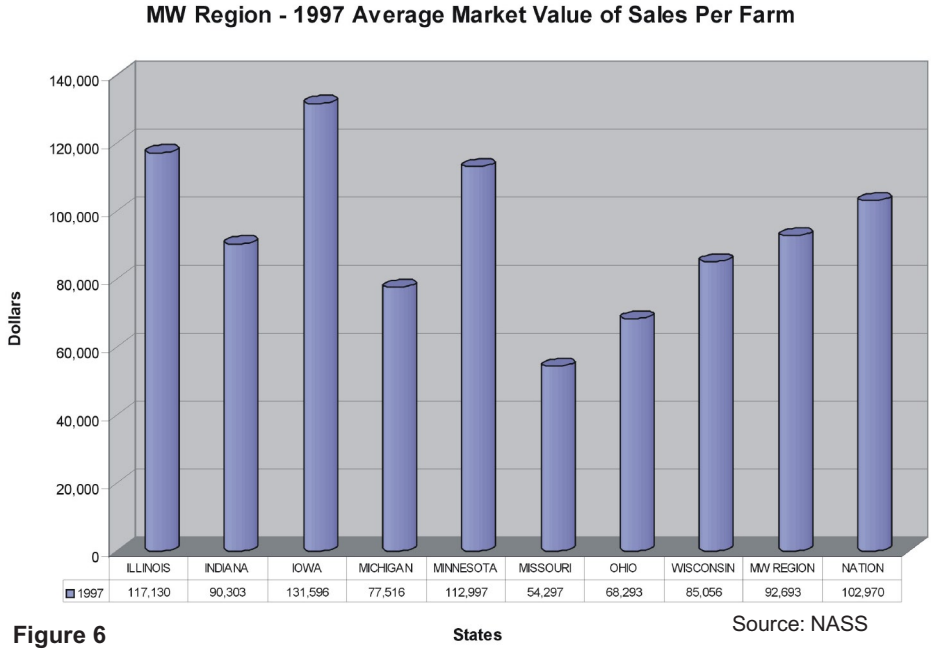


Figure 6

In 1997, the average market value of sales per farm was $92,693 for the region, compared to a national figure of $102,970. (see figure 6)

Production within the region is diverse with 55 percent of the annual farm sales associated with crop production and 45 percent related to livestock production. This diverse production requires NRCS and conservation partners to provide the needed technology that will help farmers address a multitude of natural resource issues and concerns.

Tenure of Operators

Another important component of the structure of agriculture is the tenure of farm operators. In 1997, there were about 117 million acres associated with farms where operators were part-owners or tenants. This indicates that up to 70 percent of the land in farms in the Midwest Region could be operated by someone other than the owner. The national level was 65 percent in 1997. (see figure 7)

NRCS and conservation partners work with both the landowner and the operator to plan and implement conservation practices on their land. This increases the complexity of conservation planning and requires additional staff time to provide adequate assistance.

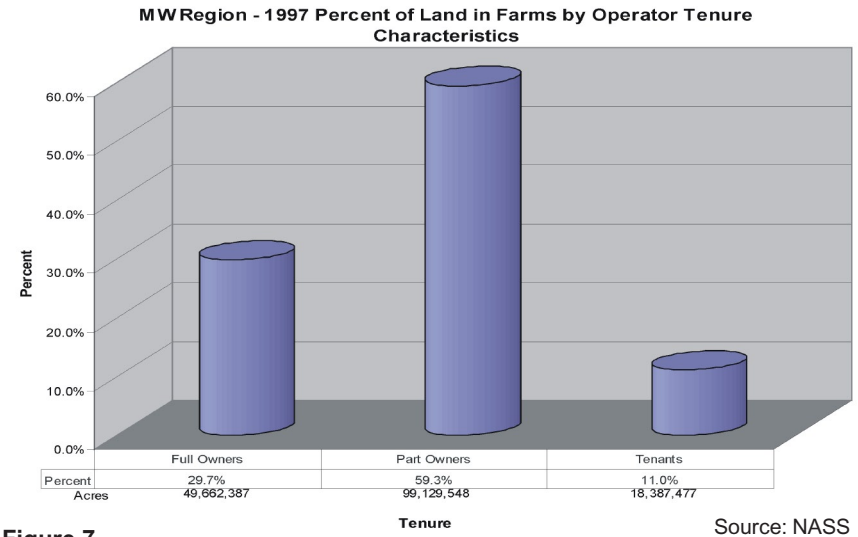


Figure 7

Source: NASS

Note: Example of each tenure category

- Full Owner: Farmer owns and operates acreage
- Part Owner: Farmer owns and operates acreage and operates additional acreage on other farms
- Tenants: Farmer does not own land but operates acreage on farm(s).

Gender of Operators

Gender is another important consideration. Although males dominate the operators' population (93 percent) in the region, there is an upward trend in the number of female operators (from 4 percent of the total in 1987 to 6 percent in 1997). In 1997 there were 36,600 farms operated by females in the Midwest, which is about 22 percent of all the farms operated by females throughout the country. The percent of female operators compared to male operators in the region continues to remain below the national percentage. However, the percentage of females is increasing over time at the same rate regionally as it is nationally. (see figure 8)

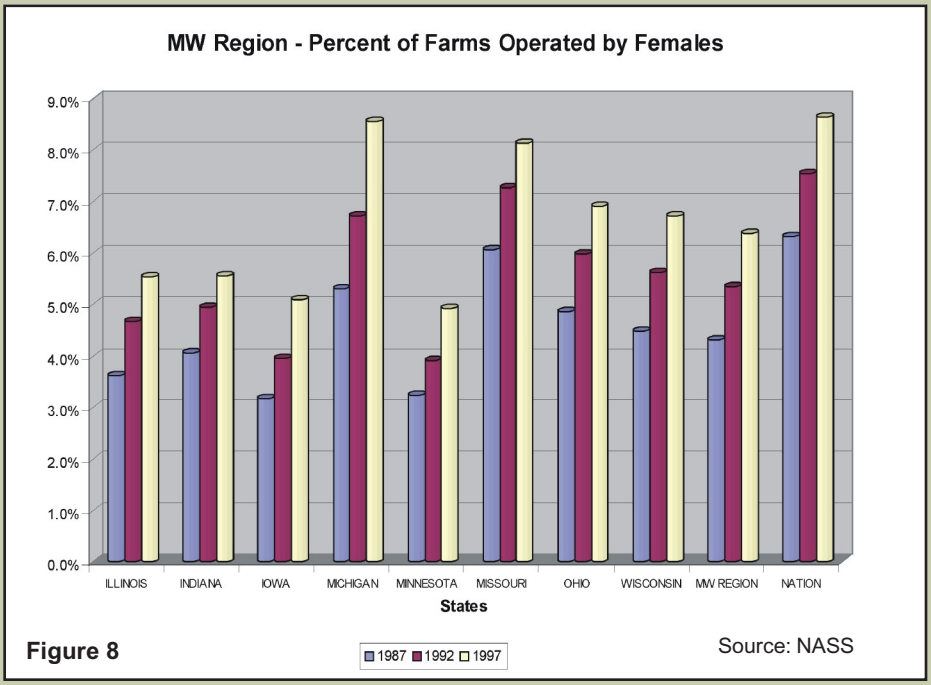


Figure 8

Source: NASS

Farm Organization

Ownership Type

In the Midwest Region, about 95 percent of the land is privately owned compared to 70 percent nationally. The responsibility for stewardship of this land is in the hands of thousands of landowners who make decisions on proper care and management of the natural resources. The knowledge, creativity, skill, and commitment to conservation of each landowner determines the overall health and productivity of the land. NRCS employees are committed to helping farmers and ranchers care for the land through the planning and implementing of conservation systems. (see figure 9)

The type of customers that NRCS provides assistance to is constantly changing. One indicator of the changes is the farm organization related to ownership type. Data indicates that sole proprietorship and partnerships are declining within the region; whereas, corporations, cooperatives, estates, and trusts are increasing. Even though the number of sole proprietorships has decreased since 1978, this group has maintained about 86 percent of the region's farms. This indicates that sole proprietorship farms are declining at about the same rate as total farms within the region. During the period of 1978 to 1997, for every ten farms lost, about nine were sole proprietorship.

The one organization ownership type that has consistently increased since 1978 has been corporations (up 95 percent). This group now represents more than 4 percent of all farms within the region and controls about 10 percent of all the land in farms. Even though these farms are organized as corporations, in 1997, more than 90 percent were family held. It is estimated that the land managed by corporations will continue to increase due to financial advantages of this structure and large corporate entities expanding their production operations.

These variations in ownership type add a significant level of complexity to the decision-making process and impact the way that NRCS works with decision-makers to address natural resource issues and concerns.

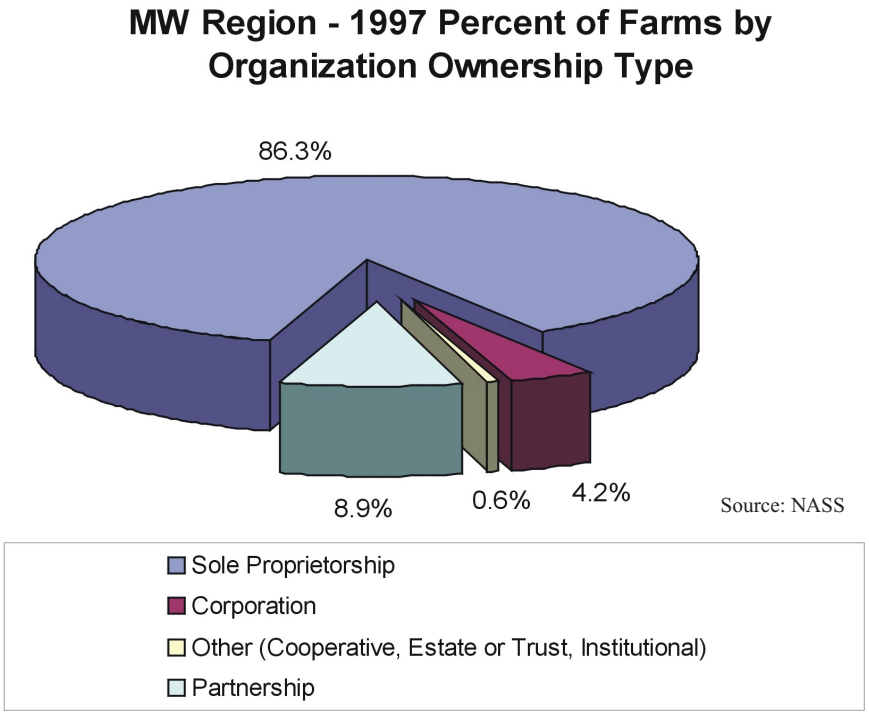


Figure 9

Summary of Structure of Agriculture

The changes that have occurred in the make-up of today's agriculture greatly impact the agencies that provide assistance to farmers. Understanding these changes can help NRCS and its partners predict the type of assistance that farmers will need in the future. These changes will also help shape the type of delivery system that NRCS and its partners will utilize to provide assistance in the future.

Midwest Region Structure of Agriculture Facts

- Thirty percent of the nation's farms are located in the Midwest Region.
- The number of farms decreased by 24 percent over the past 20 years and is currently declining at a rate of 4,200 per year.
- The number of farms with more than 1,000 acres has nearly quadrupled since 1969.
- The average size of farms continues to increase, with the current farm size just over 290 acres, which represents a 38 percent increase from 1969 to 1997.
- In 1997, 23 percent of the region's farms generated more than 83 percent of the total value of agricultural sales in the region.
- The number of small farms with less than $10,000 in annual sales has increased by 8 percent from 1992-1997.
- Fifty-five percent of annual farm sales come from crop production and 45 percent relate to livestock production.
- More than 117 million acres (70 percent of the land in farms) could be operated by someone other than the owner.
- In 1997, the number of farms operated by females increased to 36,600. Twenty-two percent of the nation's female farm operators are located in the region.
- The number of farms in the region that are organized as corporations have increased by 95 percent since 1978 and now control more than 10 percent of all land in farms.

Production

This section describes the significant crops and livestock produced in the region.

Agricultural production involves both crops and livestock and is very important to the overall economic viability of the Midwest Region. Any fluctuations have regional, national, as well as international impacts.

Livestock Production

Livestock production has always been a significant enterprise in the Midwest Region. (see figure 10) In 1997, the region's livestock numbers included:

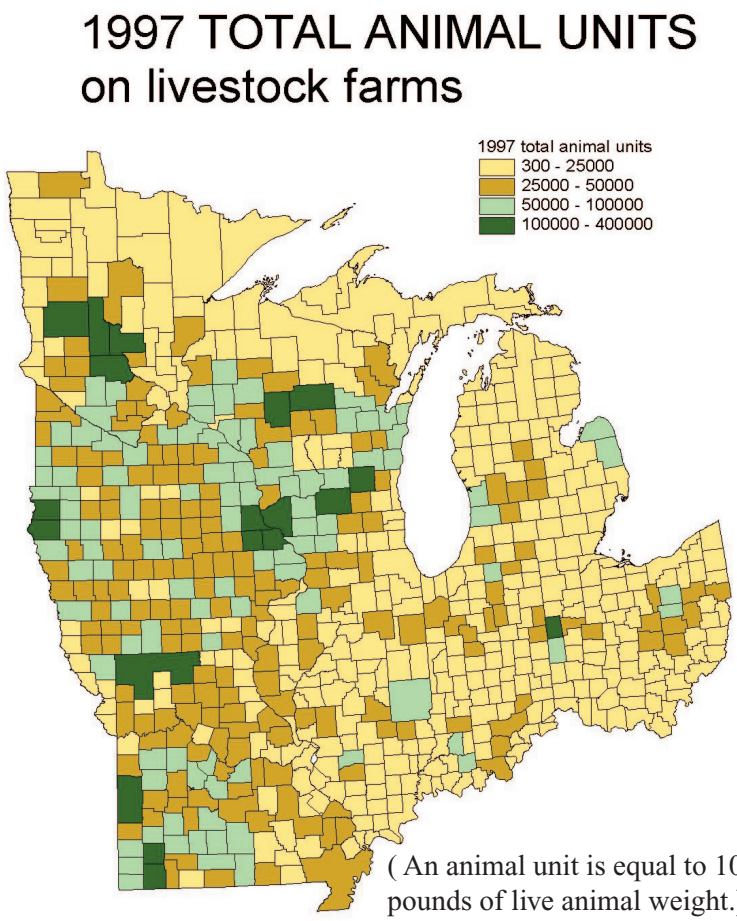
- **36 million hogs and pigs** *(59 percent of the nation's inventory)*;
- **3 million dairy cattle** *(34 percent of the nation's inventory)*;
- **18 million cattle & calves** (*34 percent of the nation's inventory)*;
- **98 million turkeys** *(33 percent of the nation's sales)*; and
- **97 million chickens** *(31 percent of the nation's sales)*.

Iowa, with almost 15 million hogs and pigs in 1997, was the industry leader outright with 41 percent of the region's and 24 percent of the Nation's inventory. While the region's hogs and pigs in inventory increased slightly, the number of farms with hogs and pigs decreased dramatically by 55 percent. However, in 1997, the region had 51 percent of the nation's hog and pig farms.

Dairy cow numbers have decreased about 25 percent within the region, with all states showing losses from 1987 to 1997. Wisconsin had 15 percent of the national dairy cow inventory and was the region's leader with 43 percent of the inventory in 1997.

Cattle and calf numbers for the region declined from 21 million head (22 percent of the nation's total) in 1987 to 18 million head (18 percent of the nation's total) in 1997. Missouri was the only state with a slight increase in cattle and calves. All other states declined. Similarly, the number of cattle and calf farms decreased across all states to 267,000 farms for the same time period. Missouri had the highest number - 67,000 farms for 1997.

The number of poultry farms continues to decline across all states from 1987 to 1997. In 1997, there were 26,000 poultry farms in the region compared to 47,000 in 1987 (45 percent decrease). Sales in the region grew from $1.9 billion in 1987 to $3.5 billion in 1997.



(An animal unit is equal to 1000 pounds of live animal weight.)

Figure 10

Crop Production

Corn remains the Midwest Region's dominant agriculture crop, with 6.4 billion bushels produced in 1997. That is 66 percent of the nation's total corn production. Acres of corn for seed or grain production grew from 39 million acres in 1987 to a high of 46 million acres in 1992. However, it dropped slightly to 45 million acres in 1997. (see figure 11)

Soybeans came in second with 1.8 billion bushels produced in 1997. (see figure 12) That is 70 percent of the nation's total soybean production. Over 35 million acres were in production in 1987 for the region. This increased to 42 million acres in 1997. Iowa, Illinois, and Minnesota have the most acres in cropland for corn and soybean production in the region.

There is a growing tendency to think of these two crops as more than 'just corn and soybeans.' They are now being separated into specific categories based on characteristics within the grain. High oil and protein corn are now being grown separately for specific markets. Separation and certification of Genetically Modified Organism (GMO) grain from organically grown grain is emerging with changes in handling and selling of grain.

Wisconsin, Missouri, and Minnesota are the three leading states in the region with 15 million acres of hay production for 1997. This is a drop from a high of 17 million acres in 1987. Missouri is the only state with an increase in the number of hay acres from 1987 to 1997. Missouri leads the region with 3.6 million acres of hay in 1997. Wisconsin had 4.7 million acres in 1987, but has dropped to 3.5 million acres in 1997 due to the declining dairy industry in the state.

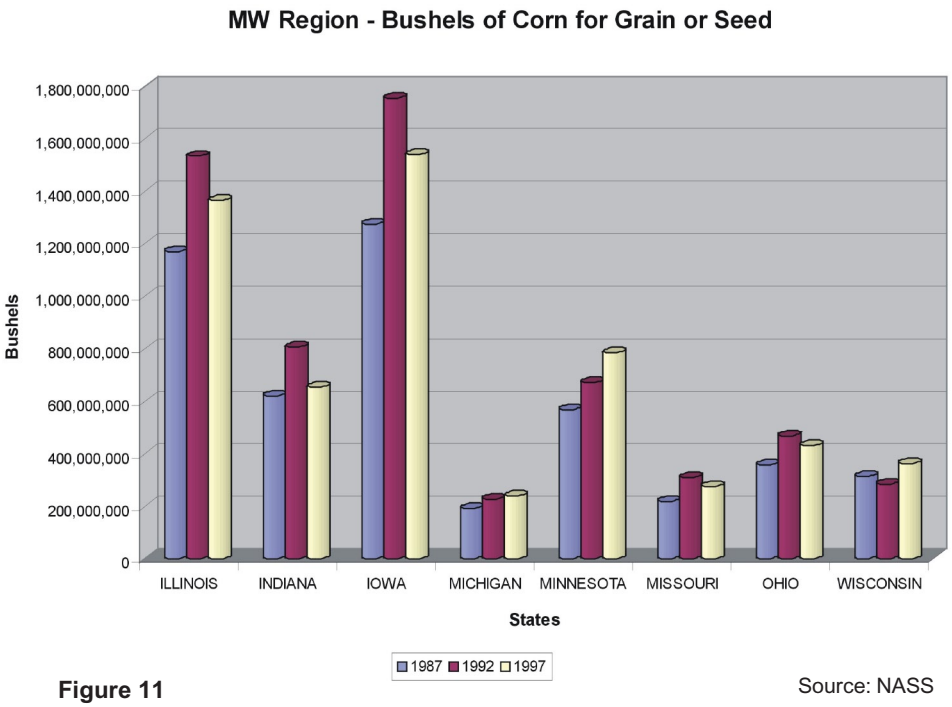


Figure 11

Source: NASS

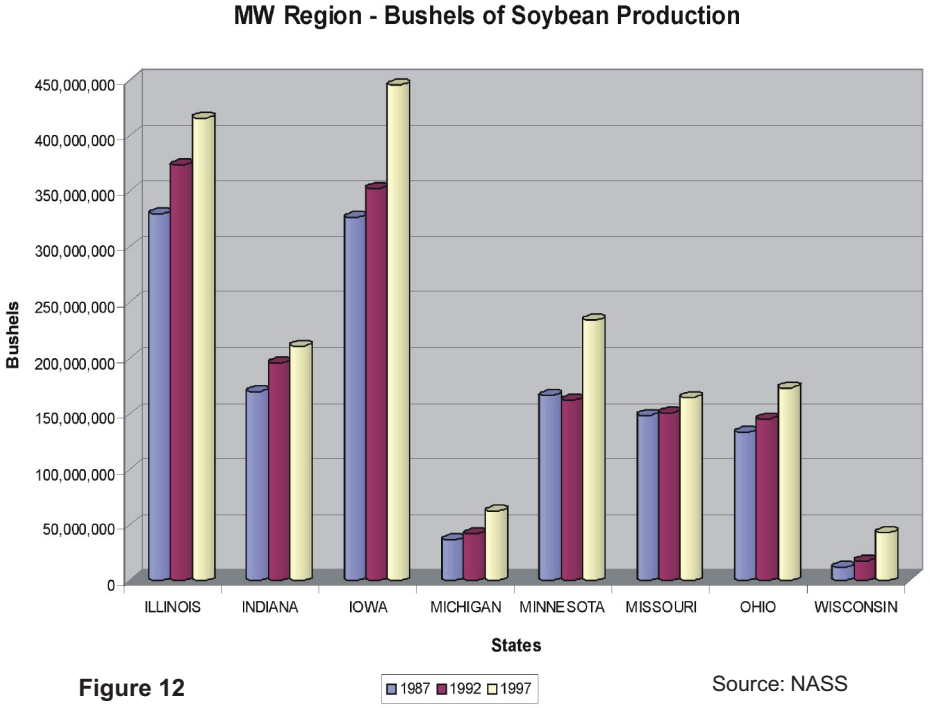


Figure 12

Source: NASS

Specialty Crops

The Midwest Region produces a variety of significant food crops for the nation. (see figure 13) For instance, in 1997, Wisconsin produced 42 percent of the nation's cranberry production (2.3 million barrels). Minnesota, Wisconsin, and Illinois processed 49 percent of the nation's sweet corn for 1997. Minnesota, Michigan, and Ohio grew over 11 million tons of sugar beets in 1997, or 38 percent of the nation's total production. In 1997, there were over 780,000 acres dedicated to growing vegetables for the region, roughly one-fifth (22 percent) of the national total. This is a decrease from 850,000 acres in 1987.

Forests

Forests contribute significantly to the overall environmental and economic health for the Midwest Region. Forestland comprises over 84 million acres, or 29 percent, of the region's land cover.

There are 350,000 workers employed in forest industries throughout the region generating a payroll of over $10 billion. These workers produce a variety of products from paper to lumber. The value of industry shipments of lumber and paper products add up to over $64 billion for the region.

Grazing Lands

In the Midwest Region, there are over 29 million acres of grazing lands, which make up 10 percent of the region's land base. This important resource provides many valuable benefits to society. Well-managed grazing lands support vegetative cover, which is resistant to wind and water erosion and provides a sustainable form of agriculture. They contribute to clean water, abundant wildlife, recreation opportunities, economic stability, and open space.

Midwest Region Cash Receipts: Top 5 Commodities in Each State, 1997

Rank	Illinois		Indiana		Iowa		Michigan	
	Commodity	Cash Receipts	Commodity	Cash Receipts	Commodity	Cash Receipts	Commodity	Cash Receipts
		million dollars		*million dollars*		*million dollars*		*million dollars*
1	Corn	3,524	Corn	1,600	Corn	3,777	Dairy Products	732
2	Soybean	3,107	Soybean	1,550	Soybean	3,293	Greenhse/nursery	433
3	Hogs	1,011	Hogs	805	Hogs	2,957	Corn	419
4	Cattle and Calves	513	Chicken eggs	300	Cattle and Calves	1,652	Soybean	402
5	Dairy Products	311	Dairy Products	279	Dairy Products	527	Cattle and Calves	218

Rank	Minnesota		Missouri		Ohio		Wisconsin	
	Commodity	Cash Receipts	Commodity	Cash Receipts	Commodity	Cash Receipts	Commodity	Cash Receipts
		million dollars		*million dollars*		*million dollars*		*million dollars*
1	Soybean	1,511	Soybean	1,180	Soybean	1,360	Dairy Products	2,948
2	Corn	1,325	Cattle and Calves	901	Corn	964	Cattle and Calves	614
3	Dairy Products	1,200	Corn	781	Dairy Products	583	Corn	606
4	Hogs	1,169	Hogs	779	Greenhse/nursery	525	Soybean	240
5	Cattle and Calves	973	Broilers	403	Hogs	413	Hogs	194

Figure 13

Source: NASS

Summary of Production

Agricultural production has an important impact on the overall economic viability of the Midwest Region. Livestock production has always been a significant enterprise including: hogs, pigs, dairy cattle, other cattle and calves, turkeys, and chickens. A variety of significant food and feed crops are produced for the Nation in the region, with corn and soybeans being the largest commodities.

Midwest Region Agriculture Production Facts

- Over 66 percent of the nation's corn is produced in the Midwest Region.
- Over 70 percent of the nation's soybeans are produced in the region.
- In 1997, there were over 780,000 acres of vegetables in the region, which is roughly 1/5 (22 percent) of the nation's total.
- In 1997, the region had more than 59 percent of the nation's hogs, with Iowa having 24 percent of the nation's hogs.
- In 1997, Wisconsin had 15 percent of the nation's dairy cows.
- The number of poultry farms declined over 45 percent from 1987 to 1997; however, the poultry sales increased from $1.9 billion in 1987 to $3.5 billion in 1997.

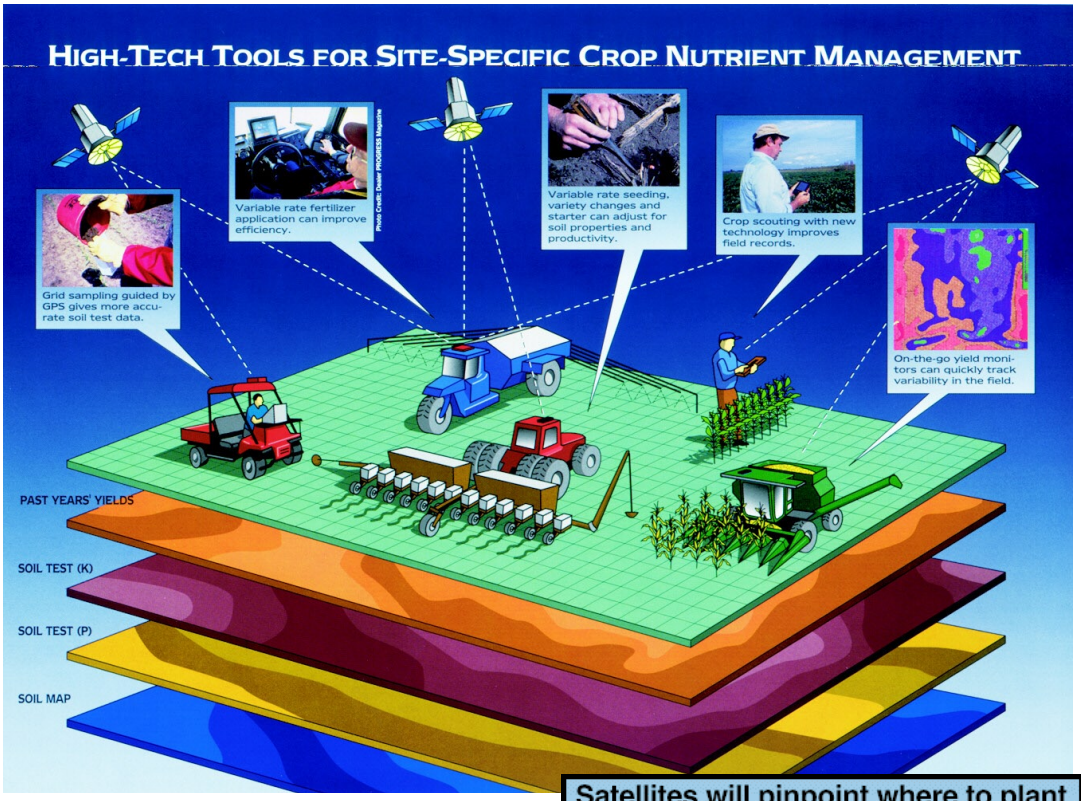
Inputs

This section discusses precision farming as it relates to agricultural inputs.

Precision Agriculture

Traditionally, farmers follow the concept of whole-field management. Farmers treat fields as a single area in which uniform applications of seed, fertilizer, and herbicide are applied even though the topography and soils may vary.

Precision Agriculture, or site-specific management, treats the variability as it relates to crop conditions, topography, and soils. This variability is best captured by a variety of ground, airborne, and satellite remote sensors. Many of these sensors are linked to Global Positioning System (GPS) receivers.



Source: PPI

Example

In 1995, there were very few GPS controlled grain quantity yield monitors. By 1998, approximately 19,000 combines in the Midwest Region were equipped with grain quantity yield monitors and of those, 50 percent had GPS units. In 1999, the number of grain quantity yield monitors increased to 25,000 and 75 percent were equipped with GPS units.

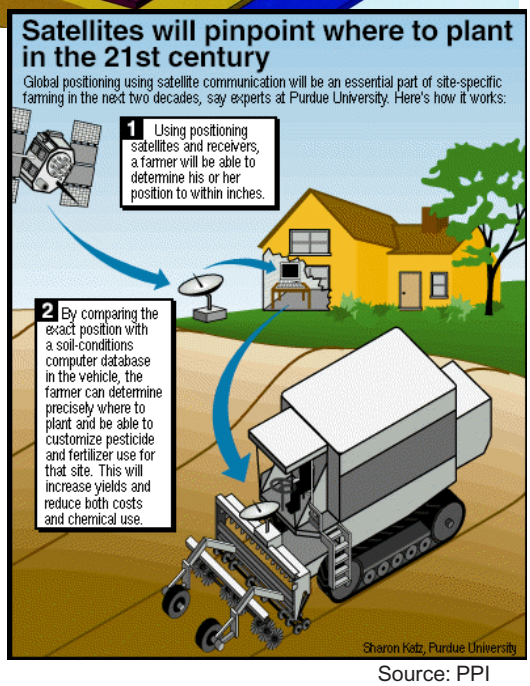
Similarly, grain quality yield monitors will be sold in the year 2001. These new monitors have the ability to quantify the amount of nutrients removed after each crop allowing the farmer to precisely apply nutrients for the next growing season.

NRCS Applications

Digital orthophotos and soils maps are two key components to any successful precision agriculture system. NRCS is funding the creation of digital orthophotos nationwide with the support of the United States Geographical Survey (USGS). In addition, NRCS is in the process of converting all the soil atlases into digitial form nationwide.

Summary

The key difference between conventional farming and precision agriculture is the application of modern information technologies. This allows producers to make decisions, which affect management of crop production. The most significant impact of precision agriculture is likely to be on how management decisions address variability in crop production systems.



Source: PPI

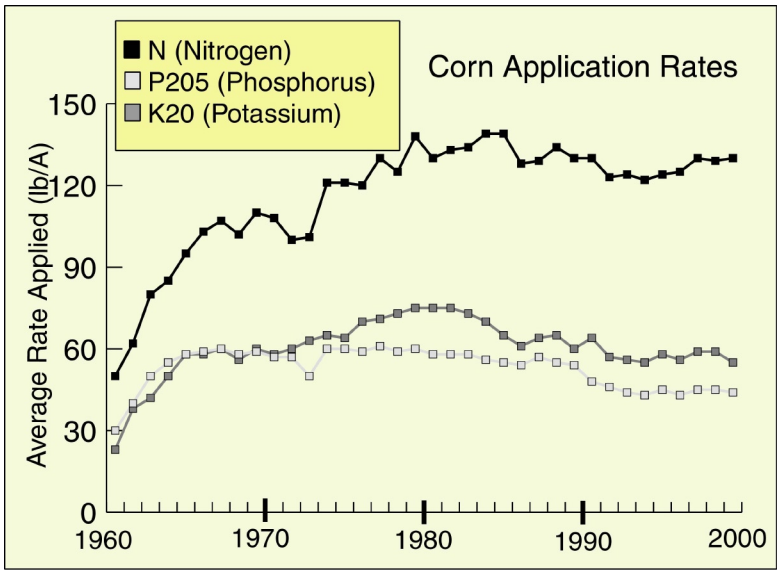
Precision agriculture has the potential to:

- **Reduce costs**
- **Increase production**
- **Reduce environmental impacts**

Trends in Fertilizer Use Efficiency

During the last quarter of a century, fertilizer use has been steady or lower and fertilizer efficiency has improved dramatically. Consider the following:

- Since the early 1980s, nitrogen use on corn has leveled off while phosphate and potassium use has declined;
- Fertilizer use efficiency (measured in terms of fertilizer units per bushel of corn or soybeans produced) has been increasing for more than 30 years. Comparing 1970 to 1998, nitrogen use efficiency on corn grown in the U.S. has increased 28 percent, while potassium and phosphate use efficiencies have jumped 127 and 75 percent, respectively. (see figure 14)

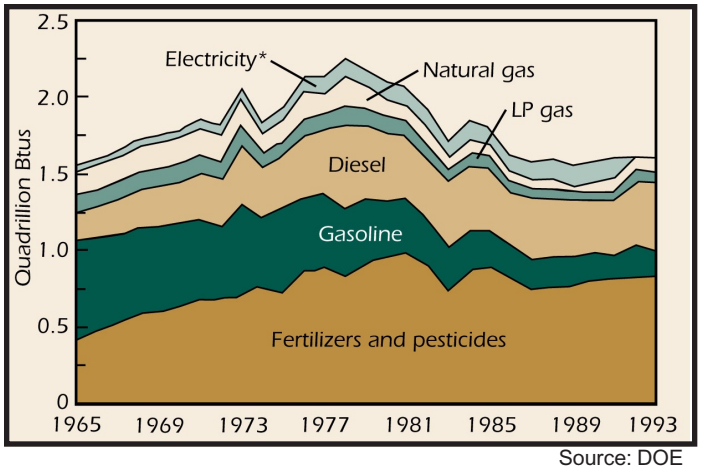


Source: PPI

Figure 14 - Utilization of animal manure will have to become an even more significant part of the management system of tomorrow's farmers and not just for livestock producers.

Energy Use

Nationally in the agriculture sector, energy use (in terms of electricity, natural gas, LP gas, diesel, gasoline, fertilizers, and pesticides) rose steadily between World War II and 1980. Since then, energy use has decreased an estimated 10 percent. The production of pesticides and fertilizers is using more energy due to their increased application, while petroleum fuel for tractors, combines, etc., have remained constant. (see Figure 15)



Source: DOE

Figure 15. Energy use in production agriculture, 1965-93. *No data on electricity use since 1991.

Animal Manure and Nutrient Management Planning

The use of animal manure will continue to impact nutrient management planning and fertilizer use. In 1996, the Council for Agricultural Science and Technology (CAST) released a comprehensive report titled *Integrated Animal Waste Management*. The report dealt with the replacement potential of animal manure. It estimated that 3.55 million tons of nitrogen, 3.06 million tons of phosphate, and 3.68 million tons of potash are potentially available for the replacement of fertilizers. On a percentage basis, manure nutrients are equivalent to 29 percent of the N and 68 percent of the P and K currently used as commercial fertilizers.

Summary of Inputs

In the past, the most productive U.S. farmers were the farmers who adopted new technologies to help them become more efficient and profitable. In order for U.S. farmers to compete in the global market, they must become even more efficient by adopting precision agriculture technologies. Farmers will be 'farming the soil' instead of the field. Not only will this increase their profits, but it will also be more environmentally friendly. USDA has a unique opportunity to jump start precision agriculture just as it has done in the past with other technologies, such as conservation tillage practices.

Midwest Region Agricultural Inputs Facts

- By promoting new precision agriculture practices and fertilizer use, fuel could be conserved.
- Adoption of precision agriculture technologies will increase farmers' profits.
- USDA has an opportunity to assist farmers in implementing precision agriculture, much like it did with conservation tillage practices.
- Implementing precision agriculture could reduce fuel and fertilizer usage.

Farm Economy

This section focuses on the current condition of the farm economy and conservation budget in the region.

Farmers today face an array of problems that may be comparable to those experienced during the depressed farm economy of the 1980s. Farm income dropped an estimated 16 percent in 1999 and economists foresee the potential for further decline on the horizon. Farmers have been battered by a combination of conditions including weather disasters, weak exports, steeply falling commodity prices, and the reduced safety net offered by the 1996 Farm Bill. On January 1, 1999, USDA data indicated that 25 percent of all commercial farm businesses had a negative farm income during 1998 and an additional 11 percent of all commercial farm businesses had a very high debt-to-asset ratio.

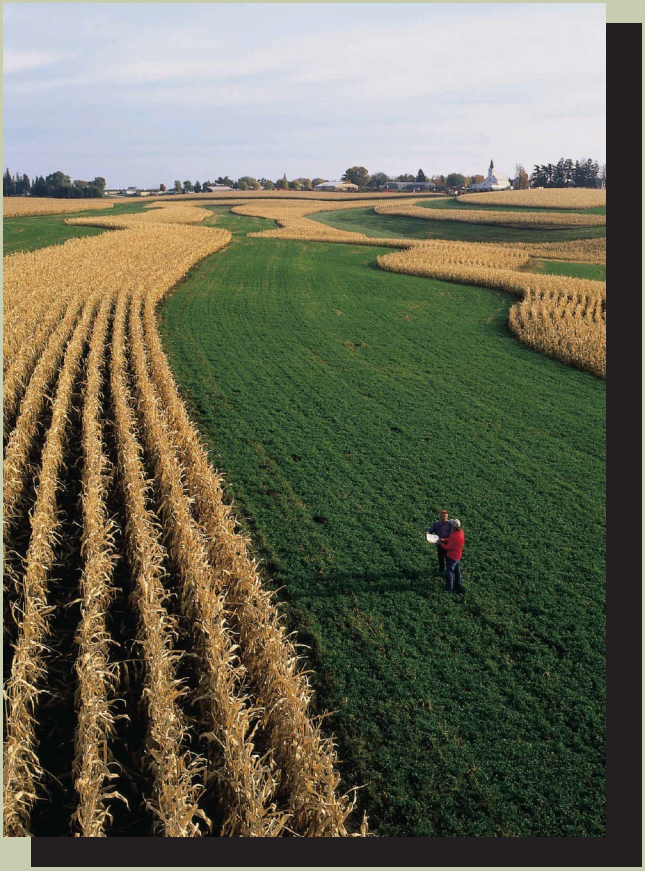
Conservation assistance may have a positive impact on the economic condition of some of the farm businesses that are experiencing hardships. This assistance, both financial and technical, can help farm businesses avoid losses related to natural hazards, minimize outlays for off-farm inputs, reduce other cost burdens, and help move toward enterprise diversification.

Conservation financial assistance (in the form of cost share, incentive, and easement payments) can provide farmers and ranchers, who are experiencing negative incomes, a much needed source of cash flow.

Additional conservation resources are needed to address critical natural resource issues in the Midwest Region, such as animal waste management, erosion on cropland and highly erodible land, wetland loss, and urban sprawl.

"Federal resources are one of the main reasons why these issues remain a national concern."
Former U.S. Secretary Dan Glickman

Currently, we invest $5 per acre toward management of public lands for every $1 per acre we invest in private lands. Additional conservation resources could address critical natural resources in the region, and in some cases, provide much needed cash flow to farm operations trying to stay in business.



The application of conservation management and practices has positive impacts on the economic condition of agricultural producers by:

- achieving cost savings through reduced reliance on purchased fertilizer and more effective use of on-farm inputs, such as animal manure;
- reducing operating cost by implementing conservation management practices and methods;
- reducing the cost of meeting certain environmental requirements under state and local laws; and
- reducing local and state property taxes for conservation application.

Farm Economy

Generally, there are no accepted criteria that define a "recession" in a particular industry, such as agriculture. Relative to history, the current drop in farm markets is severe enough to merit the term recession. Since 1957, farm cash receipts have fallen below the previous 5-year average only twice: in 1986 and 1999.

There are two fundamental causes for the weakness in the U.S. farm economy.

1. Farmers in many areas have suffered crop production losses due to disease, drought, pests, and excessive moisture.

2. Imbalances in commodity markets are due to several years of large U.S. production—despite production problems in many areas—and lower exports.

Farm prices for many agricultural commodities are at lows unseen in more than a decade. (see figures 16 and 17)

- **Average price for soybeans are the lowest since 1986/87.**
- **Average price for corn and wheat are the lowest since 1987/88.**
- **Hog prices have fallen to levels unseen since early 1920s.**
- **Cattle prices have shown some improvement; however, they remain relatively low.**
- **Milk prices have fallen to the lowest levels in over a decade.**

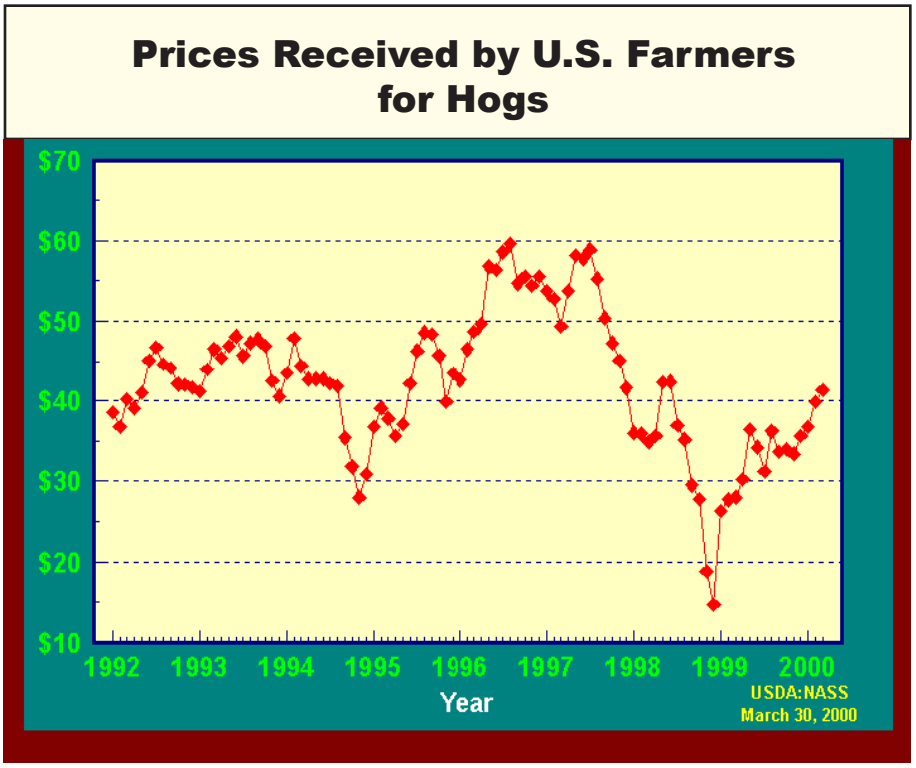


Figure 16

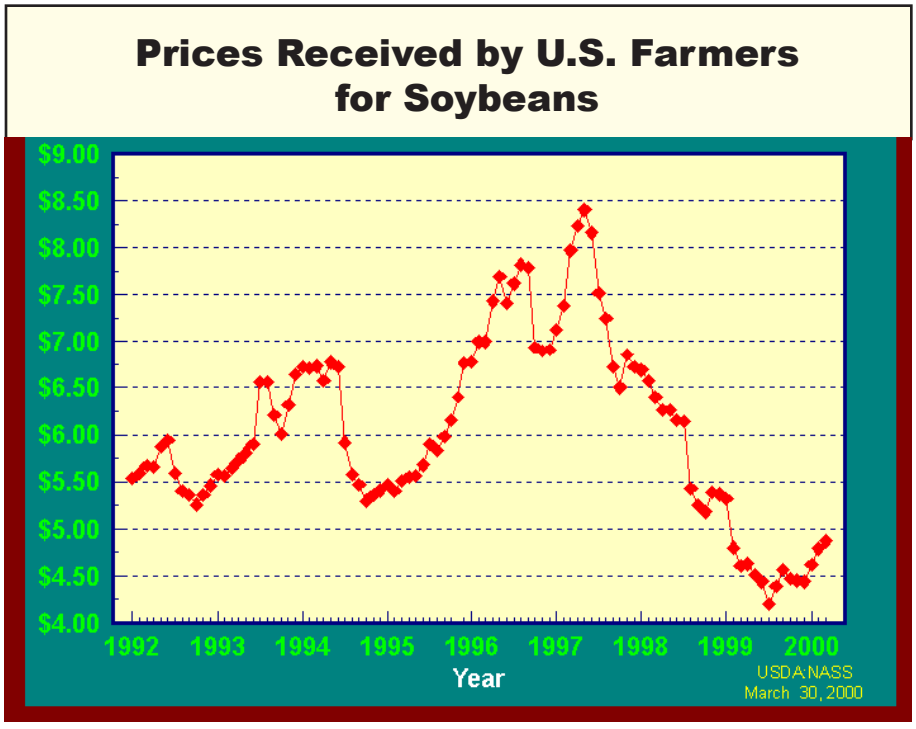


Figure 17

Another component of farm prices is the level of agricultural exports. The value of U.S. agricultural exports fell to $49 billion in Fiscal Year 2000 after reaching a record high of $60 billion in Fiscal Year 1996. Export volumes for 1999 and 2000 are higher than in 1998, but low commodity prices have held the total value down. A reduction in Asian purchases accounts for a large portion of the drop in exports of both bulk and high-value agricultural products. In 1996, $26 billion in U.S. agricultural products were exported to Asia, compared with an estimated $18 billion this year, a drop of $8 billion.

Another concern regarding the farm economy is the rising fuel prices. The cost of gasoline and diesel to operate machinery and power irrigation systems normally accounts for about 10 percent of a farmer's production input costs. If fuel costs continue to increase, it will likely become a significant input cost.

Figure 18 illustrates how the prices farmers must pay for goods continue to increase; whereas, the prices they received for their commodities are declining. The large gap between these two lines represents the current depressed farm economy.

Low prices, increased production costs, and production losses related to weather disasters have all led to reduced farm incomes. USDA estimates farm income to decline to $40.4 billion which is $8 billion less than in1999, a 16 percent decline. Forecasts for 2001 have estimated that farm incomes will decline even further to $35 billion.

These projections have increased the level of urgency for a safety net for farmers, including federal assistance. Within this assistance, an increase of conservation resources is necessary for NRCS and conservation partners. This assistance will help the already burdened farmers address natural resource concerns.

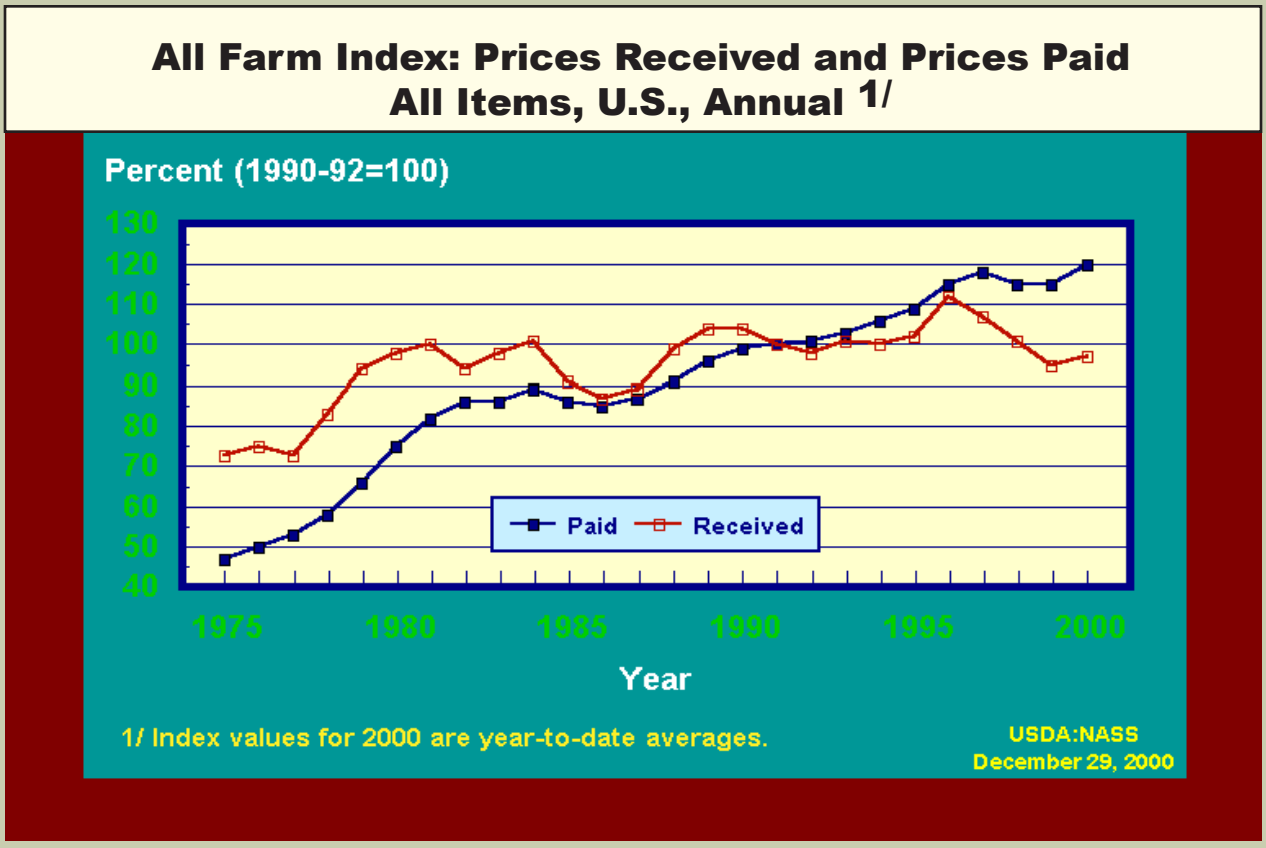


Figure 18

Conservation Financial Assistance

During Fiscal Year 2000, over $500 million (financial assistance) was provided to private landowners in the eight-state Midwest Region through USDA conservation programs. These programs and the financial assistance included:

- Wetlands Reserve Program (6%);
- Conservation Reserve Program (Regular, Continuous, and CREP) (80%);
- Environmental Quality Incentives Program (5%);
- Emergency Watershed Protection Program (6%);
- Small Watershed Program (2%); and
- Wildlife Habitat Incentives Program (1%).

Program dollars were administered through approximately 120,000 contracts or agreements. NRCS administers these programs and helps land users, communities, and others in planning and implementing conservation systems that protect the environment.

NRCS funding level for both financial and technical assistance has averaged about $233 million per year for the region, since 1994. For the most part, funding has been level for this time period with fluctuations primarily due to large emergency fund allocations in 1998 and 1999.

Resource Conservation and Development (RC&D)

Through the use of voluntary, non-profit councils, made up of local people, the RC&D helps people address improvement of their local economy, environment, and standard of living.

Currently, 69 RC&D Councils in the Midwest Region help people address these very issues. Councils usually focus on activities and projects related to natural resources, agriculture, community, and social responsibilities. More specifically, they address concerns in community improvement, cultural resources, economic development, fish and wildlife, forestry, information and education, marketing and merchandising, natural resources improvement, recreation and tourism, and water supply and water quality. Some also have loan programs. (see Figure 19)

They provide assistance to a broad and diverse customer base that includes agricultural producers, small business owners, local governments, other nonprofits, community groups, minorities, people with disabilities, women-owned and operated businesses, low-income landowners, and multi-community and inner-city development groups among others.

In Fiscal Year 2000, RC&D provided technical and financial assistance and grants to regional customers totaling more than $34 million. More importantly, over 2 million individuals and groups benefited from this assistance.

It is estimated that $10 - $12 is generated locally for every RC&D program dollar invested.

Midwest RC&D Areas

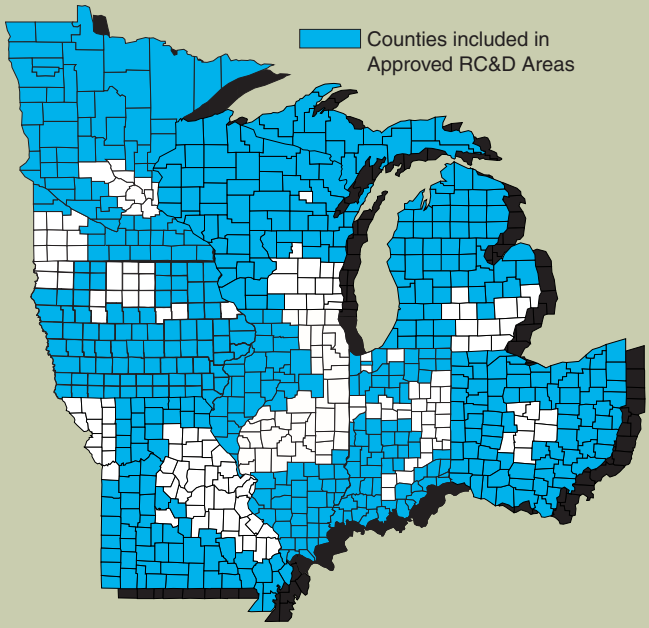


Figure 19

Summary of Farm Economy

Many agricultural producers are facing economical and financial crises as we start the new millennium. At the same time, society is demanding that the condition of the nation's natural resources continue to improve. Most of the improvements will be the result of conservation systems planned and applied on privately-owned land. NRCS will continue to help agricultural producers meet their environmental and economical objectives. Conservation programs administered by NRCS help farmers continue to protect and enhance the environment, while increasing farm family income.

Farm Economy and Conservation Financial Assistance Facts

- On January 1, 1999, USDA indicated that 25 percent of all commercial farm businesses reported negative farm income during 1998.
- Farm prices for many Midwest agricultural commodities are at lows unseen in more than a decade.
- USDA estimated farm income to decline to $40.4 billion, which is $8 billion less in 1999 (16 percent decline).
- Currently, we invest $5 per acre toward management of public lands for every $1 per acre we invest in private lands.
- NRCS funding level for both financial and technical assistance has averaged about $233 million per year for the region, since 1994.
- It is estimated that $10-$12 is generated locally for every RC&D program dollar invested.

Land Use

This section discusses the changing land use and the loss of agricultural land.

The Midwest Region encompasses an area of roughly 293 million acres, according to the USDA-NRCS 1997 National Resources Inventory (NRI). Cultivated cropland dominates the central part of the region from western Ohio, through Indiana, Illinois, Iowa, and southern Minnesota. In 1997, cultivated cropland accounted for 116.4 million acres or 40 percent of the total midwest acreage. Pastureland and rangeland are major midwest land uses with Wisconsin and Missouri, accounting for 29 million acres. In 1997, forestland comprised 76 million acres, or 26 percent for the region (excluding federal lands). Northern conifer forests cover northern Minnesota, Wisconsin, and Michigan while southern hardwoods cover Missouri, southern Illinois, Indiana, and Ohio.

From 1982 to 1997, the region has seen the following changes:

Losses

Cultivated Cropland	9,814,600 acres
Pastureland	6,441,400 acres
Rangeland	55,700 acres
Minor Land Cover	389,900 acres
Rural/Transportation	43,700 acres
Total Losses	**16,745,300 acres**

Gains

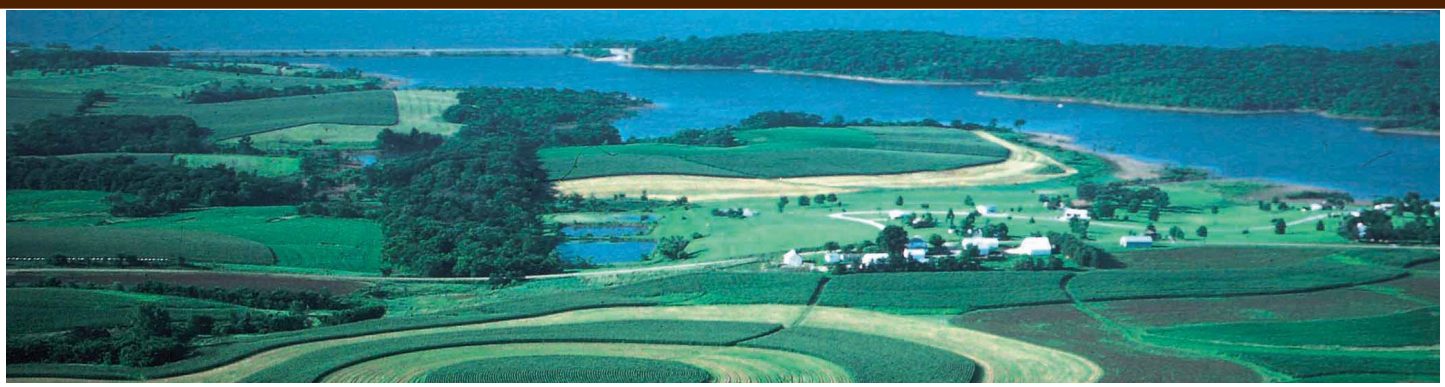
Non-cultivated Cropland	2,168,700 acres
Forestland	2,958,600 acres
Urban	4,058,000 acres
Permanent Open Water	42,800 acres
Water Bodies>40 acres	51,400 acres
Federal Land	166,700 acres
CRP	7,299,100 acres
Total Gains	**16,745,300 acres**

The losses are primarily from 6,232,000 acres of cultivated cropland being converted to Conservation Reserve Program (CRP) lands. Most of these changes are occurring around the major metropolitan areas of Detroit, Chicago, Milwaukee, St. Louis, and Minneapolis/St. Paul.

In addition, 430,800 acres of cultivated cropland were shifted to pastureland. Land converted to urban land equals 1,713,900 acres.

Similarly, 1,181,400 acres for forestland and 713,000 acres of pastureland were converted to urban land from 1982 to 1997.

Forestland increased by 3 million acres due to marginal agriculture lands being converted back to forests.



Natural Resource Issues in the Midwest Region

This chapter describes the resource issues facing the region and conservation efforts to address them.

Soil Erosion

This section discusses the conservation efforts to control soil erosion.

The Problem

Soil erosion caused by wind and water remains a significant agricultural and environmental concern in the Midwest Region. In 1997, approximately 25.5 million acres of cultivated cropland had erosion rates exceeding tolerable limits (T), thereby reducing soil productivity. In fact, about 39 percent of these acres are eroding at rates at least twice the tolerable limits. Excessive soil loss on agricultural land leads to depletion of the soil resource base, reducing the land's ability to produce food, feed, and fiber. Degraded soils require more input, such as fertilizer and energy, for tillage to produce crops equal to those grown on less eroded soils. This increases costs to producers and ultimately to consumers. On some eroded soils, it is impossible to replace the lost productivity with fertilizer and other amendments, so actual production potential is lost.

Soil erosion causes other problems also. Sediment and attached chemical particles are a serious threat to the quality of surface water within the region. Gully and streambank erosion frequently causes significant damages to roads, bridges, and other infrastructure. Wind blown soil can create significant air quality problems, reduce visibility, and damage crops.

In 1997, over 22 percent of the region's cultivated cropland was eroding at annual rates greater than the tolerable rate (T). T is the level of soil erosion that is tolerable, meaning that it does not harm soil productivity.

The Successes

Erosion rates in the region have been declining since the early 1980s. Much of this reduction is due to the conservation compliance provisions of the 1985 and 1990 Farm Bills, adoption of conservation tillage, and enrollment of highly sensitive lands in the Conservation Reserve Program (CRP). From 1992-1997, total erosion, due to water movement, was reduced 12.7 percent for the region. This compares to a 19.9 percent reduction from 1987-1992.

Significant reductions in soil erosion have occurred in the region, during the past 15 years. Due to water, annual rates of sheet and rill erosion on cultivated cropland have decreased from 5.7 tons/acre/year in 1982 to 3.7 tons/acre/year in 1997. This represents a reduction of over 35 percent, which compares to a national reduction of 29 percent for the same time period. (see figure 20)

Soil erosion occurring on cultivated cropland (compared to erosion on all other land) accounts for about 90 percent of all erosion in the Midwest Region. This percentage has remained fairly constant over the last 15 years. Cropland is eroding nationally at a rate of 1.3 billion tons per year. In the Midwest Region, water is the primary source for erosion. (see figure 21)

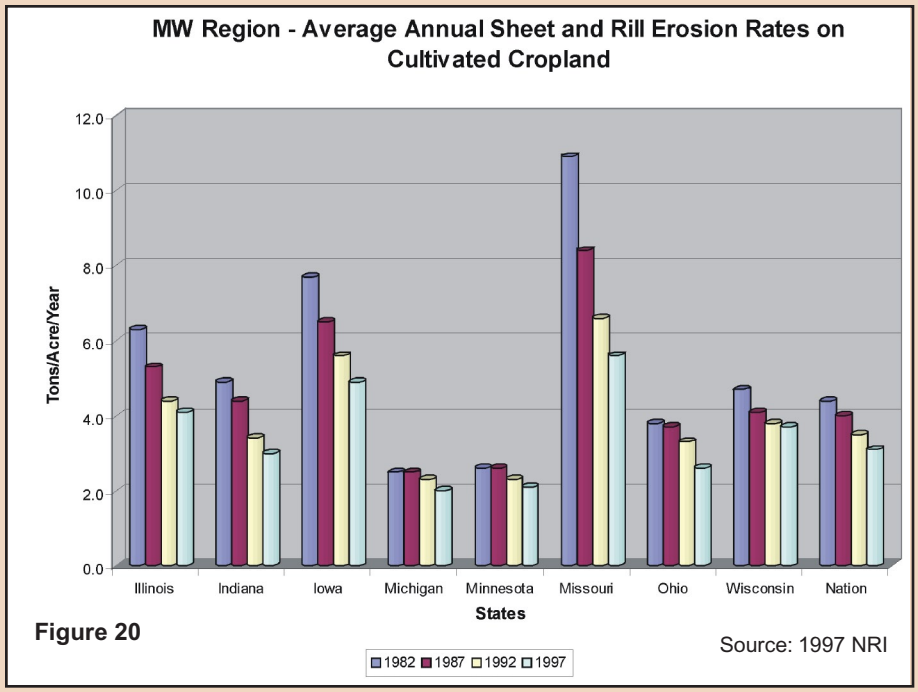
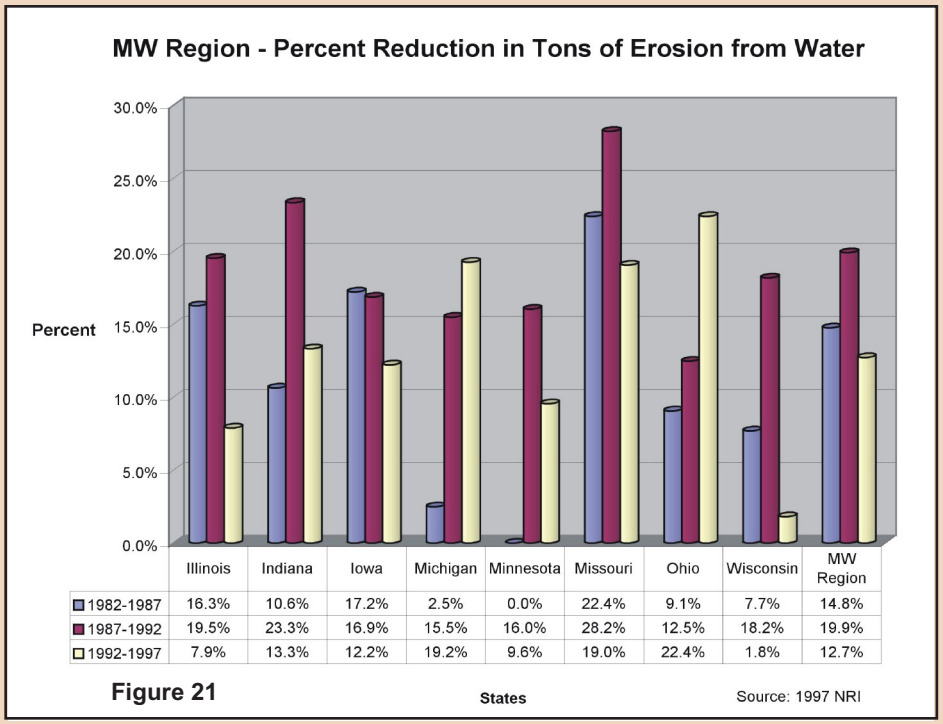


Figure 20



	Illinois	Indiana	Iowa	Michigan	Minnesota	Missouri	Ohio	Wisconsin	MW Region
1982-1987	16.3%	10.6%	17.2%	2.5%	0.0%	22.4%	9.1%	7.7%	14.8%
1987-1992	19.5%	23.3%	16.9%	15.5%	16.0%	28.2%	12.5%	18.2%	19.9%
1992-1997	7.9%	13.3%	12.2%	19.2%	9.6%	19.0%	22.4%	1.8%	12.7%

Figure 21

The Methods Used

Conservation tillage continues to have a great impact on the levels of erosion occurring on cropland in the region.

Conservation tillage includes any conservation system that covers at least a third of the soil with crop residue after planting.

In 1998, there was approximately 50 million acres of cropland with conservation tillage systems or about 46 percent of the nation's acreage of conservation tillage. Iowa and Illinois were the top two states in the country with over 21 million acres of conservation tillage. However, from 1997 to 1998, the region experienced a decline of over 2.2 million acres of conservation tillage. This decrease represents a 10 percent decline of conservation tillage within the region. (see figure 22)

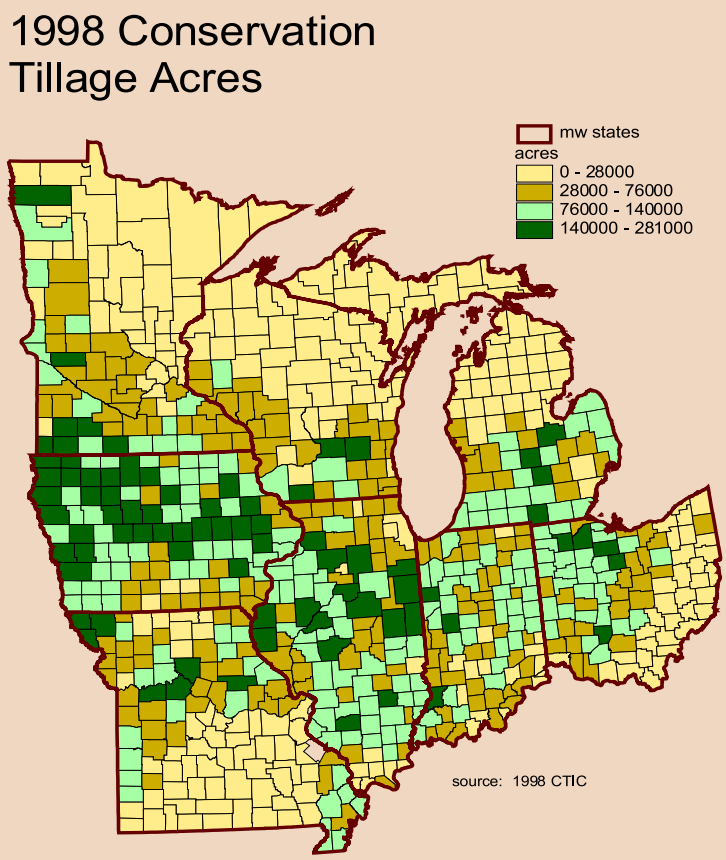


Figure 22

CRP has also had a significant impact on the reduction of soil erosion in the region. In 2000, approximately 7.3 million acres were enrolled in CRP. (see figure 23)

Through this program, landowners are encouraged to protect fragile land by planting resource-conserving cover to improve soil, water, and wildlife resources. Currently, over 22 percent of the land enrolled in CRP nationally is within the region.

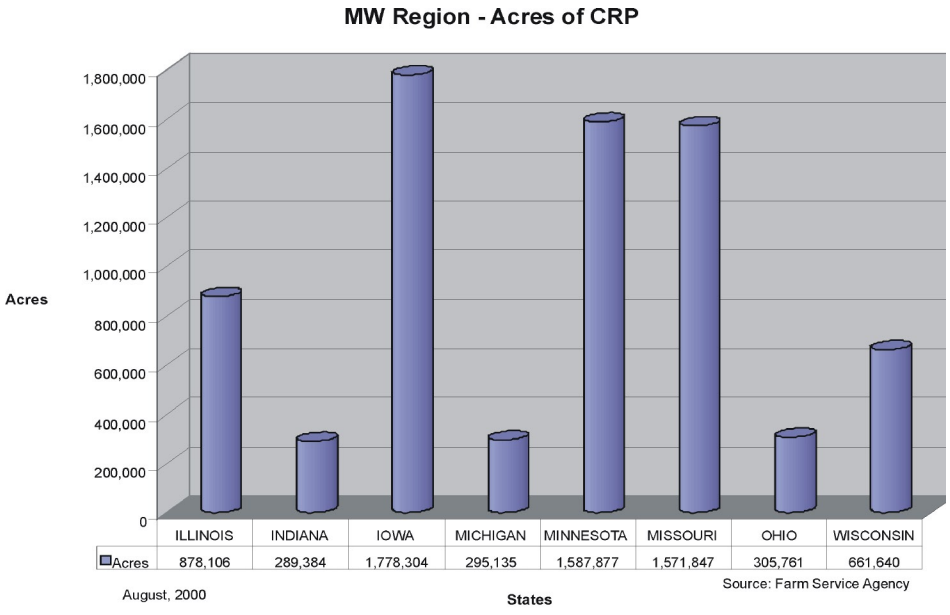


Figure 23

Another initiative impacting the reduction of erosion in the region is the National Conservation Buffer Initiative. In 1997, USDA officially launched this initiative, which pledged to help landowners install conservation buffer practices. Conservation buffers, when coupled with other appropriate conservation practices, can play an important role in reducing erosion and sedimentation. The Continuous CRP and the Conservation Reserve Enhancement Program (CREP) have been developed to help landowners establish conservation buffer practices.

Since 1997, more than 50 percent of the buffer acres established nationally have been in the region. As of October 1, 2000, approximately 665,000 acres of buffers have been established in the region through the Continuous CRP and CREP. (see figure 24)

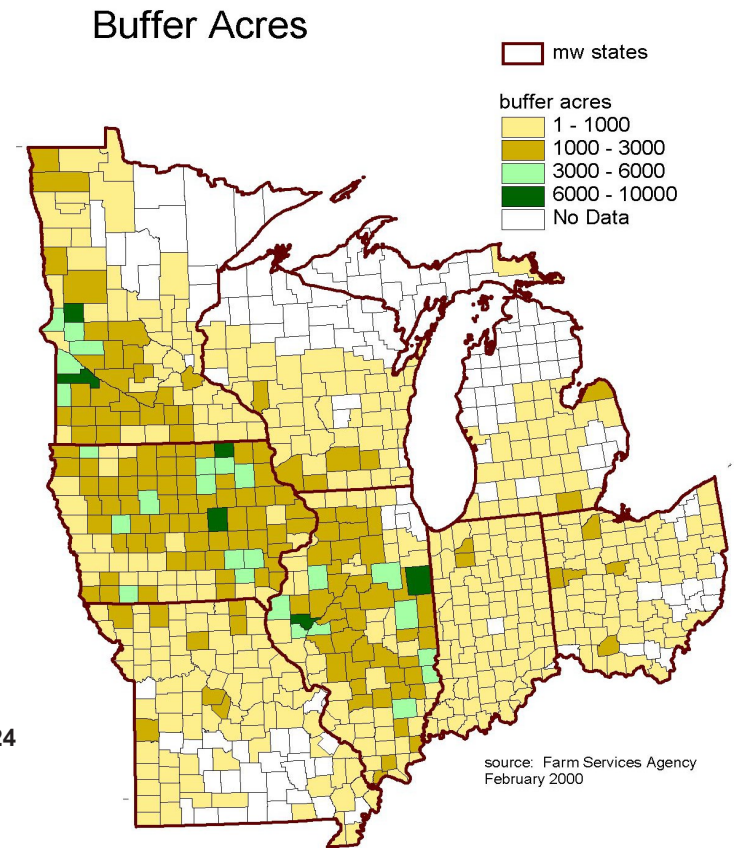


Figure 24

The Soil Erosion Concern Remains

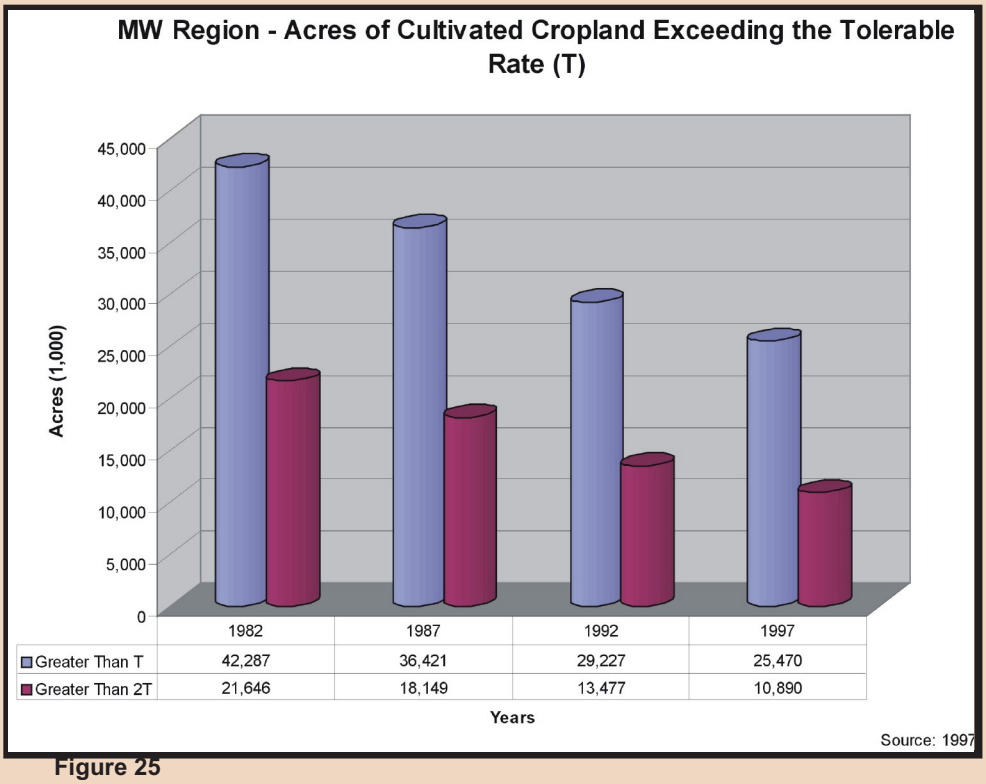


Figure 25

Even with the significant accomplishments during the last 15 years, excessive erosion continues to be a serious problem in the region. In 1997, nearly 26 million acres of cultivated cropland exceeded the tolerable annual erosion rate (T), and over 10 million acres were eroding at a rate of twice the tolerable rate. (see figure 25) Based on this data, more than 22 percent of the cultivated cropland in the region are eroding at annual rates greater than the tolerable rate (T). Even though this percent has decreased from 34 percent in 1982, there is considerable conservation needed in the region to address soil erosion.

Summary of Soil Erosion

Significant reductions in soil erosion have occurred in the region, during the past 15 years. These reductions have been a result of the conservation compliance provisions of the 1985 and 1990 Farm Bills, adoption of conservation tillage, and enrollment of highly sensitive lands in the CRP. However, even with the significant accomplishments during the last 15 years, excessive erosion continues to be a serious problem in the region. While erosion can reduce soil productivity, it also has a substantial effect on the quality of our air and water resources. NRCS will continue to work with producers on addressing excessive erosion on the 26 million acres of cultivated cropland that are eroding at rates that are harmful to the soil productivity and the environment.

Midwest Region Soil Erosion Facts

- From 1992-1997, total erosion, due to water movement, was reduced 12.7 percent for the region.
- The annual rates of sheet and rill erosion on cultivated cropland, due to water, have decreased 35 percent from 1982-1997.
- In 1998, 46 percent of the nation's acreage of conservation tillage was in the region; however, the acres of conservation tillage did decline 10 percent in the region from 1997-1998.
- Currently, within the region, there is approximately 7.3 million acres enrolled in CRP or 22 percent of the national total.
- As of October 1, 2000, approximately 665,000 acres of buffer conservation has been established in the region through the Continuous CRP and CREP
- In 1997, nearly 26 million acres of cultivated cropland (or 22 percent) exceeded the tolerable annual erosion rate (T).

Wetlands

This section discusses wetland resources in the region.

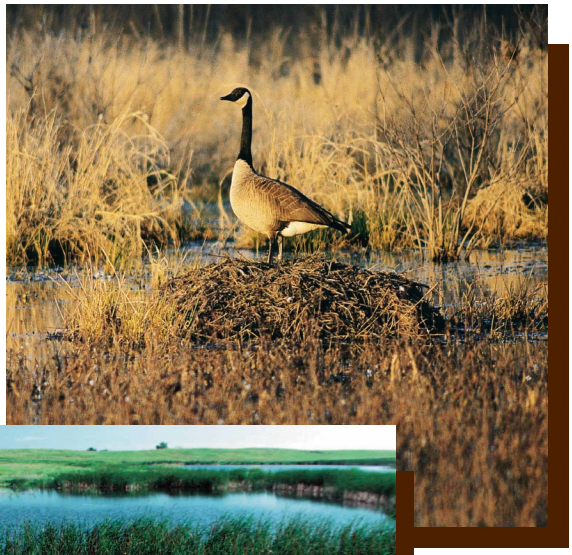
Wetland conservation is one of the most important and sensitive natural resource issues in the Midwest Region, in both agricultural and non-agricultural areas. "Wetlands" describes a variety of areas where plants and animals, especially suited to wet environments, can be found.

Wetlands are important because they have unique functions and values. They provide floodwater retention, groundwater recharge and discharge, streambank and shoreline stabilization, and sediment trapping. In addition to the traditional role of providing essential habitat for waterfowl, other migratory birds, and resident wildlife; wetlands also aid in the removal of nutrients and chemicals, providing forage, and livestock water.

Conversion of wetlands to agricultural land has declined steadily since the 1950s. In the mid-1950s, agriculture, with government encouragement, was responsible for an estimated 87 percent of wetland conversion. In contrast, between 1982 and 1992, 56.7 percent of the total wetland losses were attributed to urban development and only 19.8 percent to agriculture. (see figure 26)

The requirements of the Clean Water Act; the 1985 Food Security Act; as amended by the 1990 and 1996 Farm Bills; and the 1993 Federal Wetlands Policy have heightened the awareness and controversy of wetlands across the nation.

In 1997, the region had approximately 27,032,100 acres of palustrine wetlands, which represented about 25 percent of the nation's wetlands. This figure represented a loss of 74,200 acres of wetlands for the period of 1992-97. Over half of the losses can be attributed to agricultural activity and one-third to urban development.



Wetlands are often called the "kidneys of the landscape," mother nature's way of filtering out harmful materials.

Annual Wetland Losses for Agriculture Uses such as Cropland and Pastureland

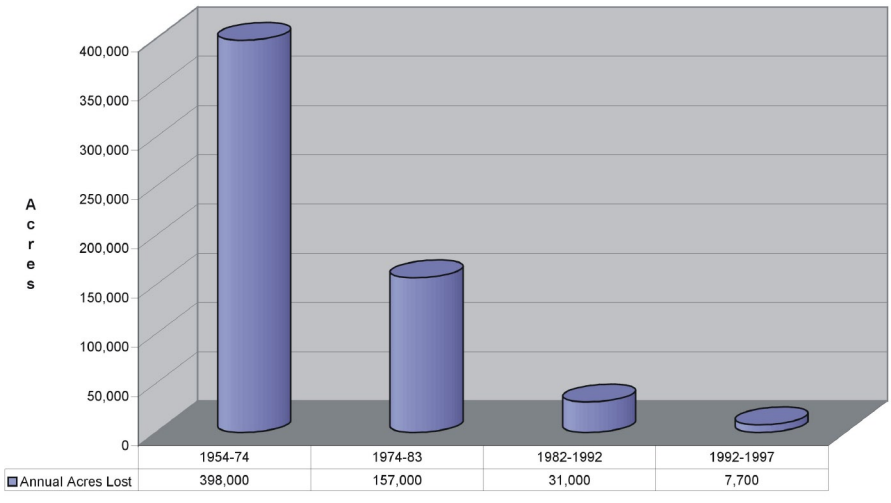


Figure 26

Source: USDA NRI, Dept. of Interior

"No net loss" and a call for a long-term gain sets the stage for the treatment of wetlands. The goal of "no net loss" refers to the Nation's overall wetland base. There must be a balance between wetland losses and gains in the short run and an increase in wetland acreage in the long run.

Achieving "no net loss" and moving into a net gain in wetlands may be possible, if restoration programs like the USDA's Wetlands Reserve Program (WRP) continue to be sufficiently funded. (see figure 27)

The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. NRCS provides technical and financial support to help landowners. Since 1992, there have been more than 311,000 acres of wetlands restored or in the process of being restored in the region through the WRP and Emergency Wetlands Reserve Programs (EWRP). (see figure 28)

The acres have been enrolled through the acquisition of over 2,600 easements. The wetland conservation programs have been very successful and popular in all eight states within the region.

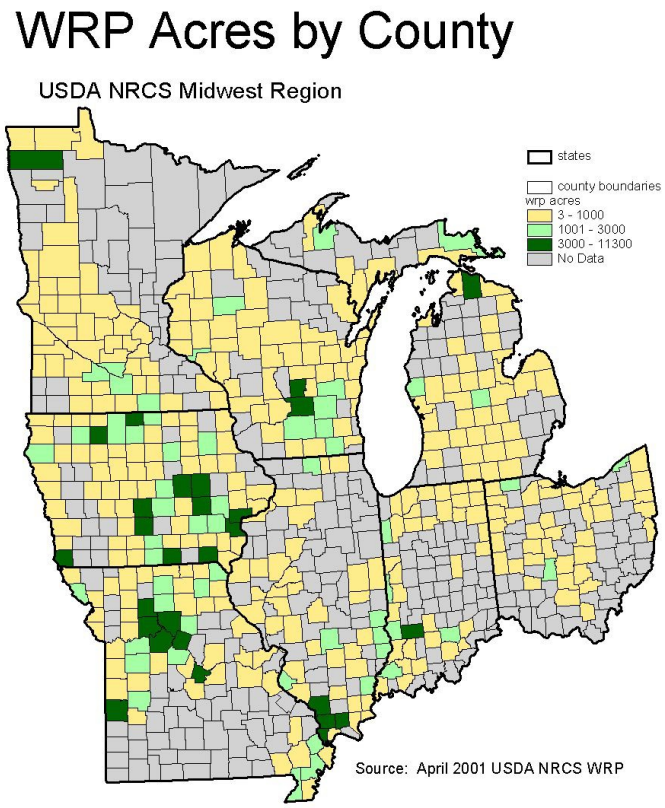


Figure 27

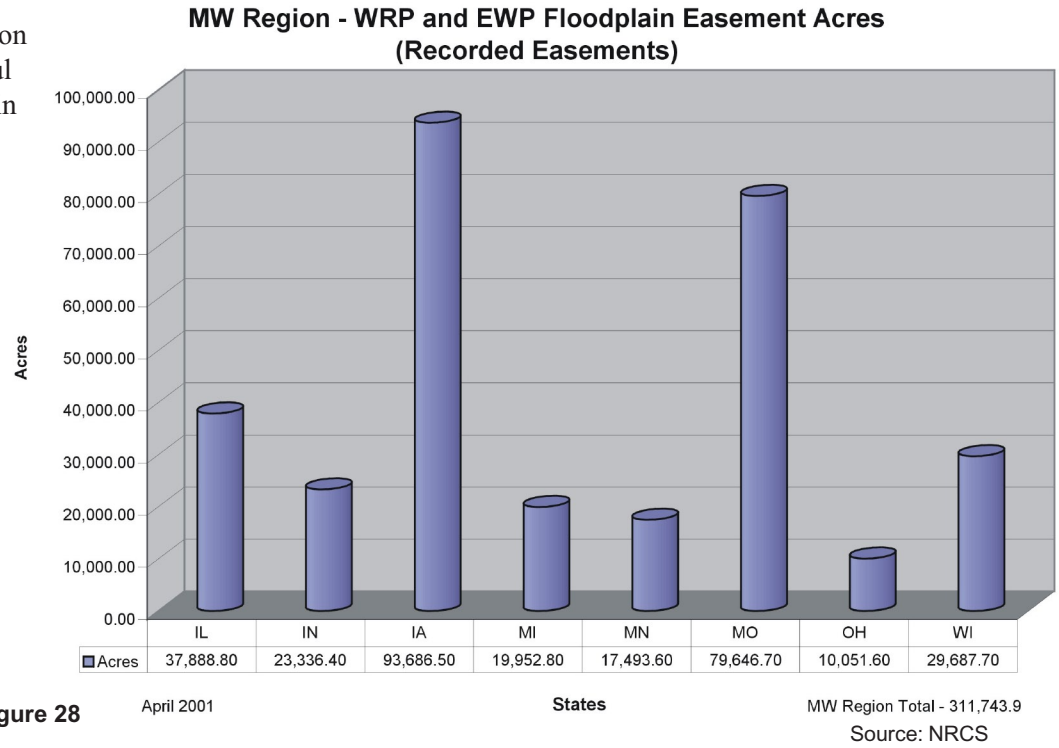


Figure 28

Animal Waste/ Nutrient Management

This section discusses the magnitude of the animal waste and nutrient management issues in the region.

Animal waste and nutrient management are critical issues in the Midwest Region. The high levels of livestock production ensures this issue continues to be a high priority for producers, NRCS, and partners. Nonpoint source contamination of water remains one of the most significant challenges facing agriculture today. Water quality data continues to identify agriculture as one of the major contributors to impairment of water resources.

As part of the 1998 Clean Water Action Plan, the "Unified National Strategy for Animal Feeding Operations" directed USDA and EPA to jointly implement a strategy to minimize environmental and public health impacts from Animal Feeding Operations (AFOs). An AFO is an agricultural enterprise where livestock are kept and raised in confined situations for 45 days in a 12-month period, e.g. feedlots. This joint strategy calls for the development of Comprehensive Nutrient Management Plans (CNMP) to address the AFOs resource concerns.

It is estimated that there are approximately 108,500 AFOs in the region that need CNMPs. This figure represents 39 percent of the AFOs nationally needing CNMPs.

Over 39 percent of the nation's Animal Feeding Operations (AFOs) needing Comprehensive Nutrient Management Plans are in the Midwest Region.

The trend of concentrating livestock into larger units has produced large volumes of manure. In today's agriculture, thousands of cattle and hog operations require large amounts of imported feed. Therefore, large amounts of manure need to be exported or utilized properly. Concentrated animal production sites are of particular environmental concern because of the potential for nutrient and bacterial contamination of water resources. Odor problems affect air quality as well. Industrialization of the livestock production sector, spurred by economies of size, and new production and processing technologies has produced livestock concentrations and geographic shifts within the region.

The link between feed production and livestock concentration in the region allows for land application of animal manure and recycling of the nutrients in the crop production system. However, this application does not mean that all manure is now being handled adequately. Proper storage and application of manure will help ensure that the available nutrients do not threaten or pollute water resources.

Within the region, there has been a slight decline in the number of animal unit* equivalents on livestock farms from 1982 to 1997. In 1997, there were just over 21.3 million animal units in the region, which compares to 27.8 million in 1982 (23 percent decline). In 1997, Iowa and Missouri accounted for 42 percent of the total animal units within the region. In 1997, the region accounted for 23 percent of the national total of animal units. (see figure 29)

(* An animal unit (AU) is equal to 1000 pounds of live animal weight.)

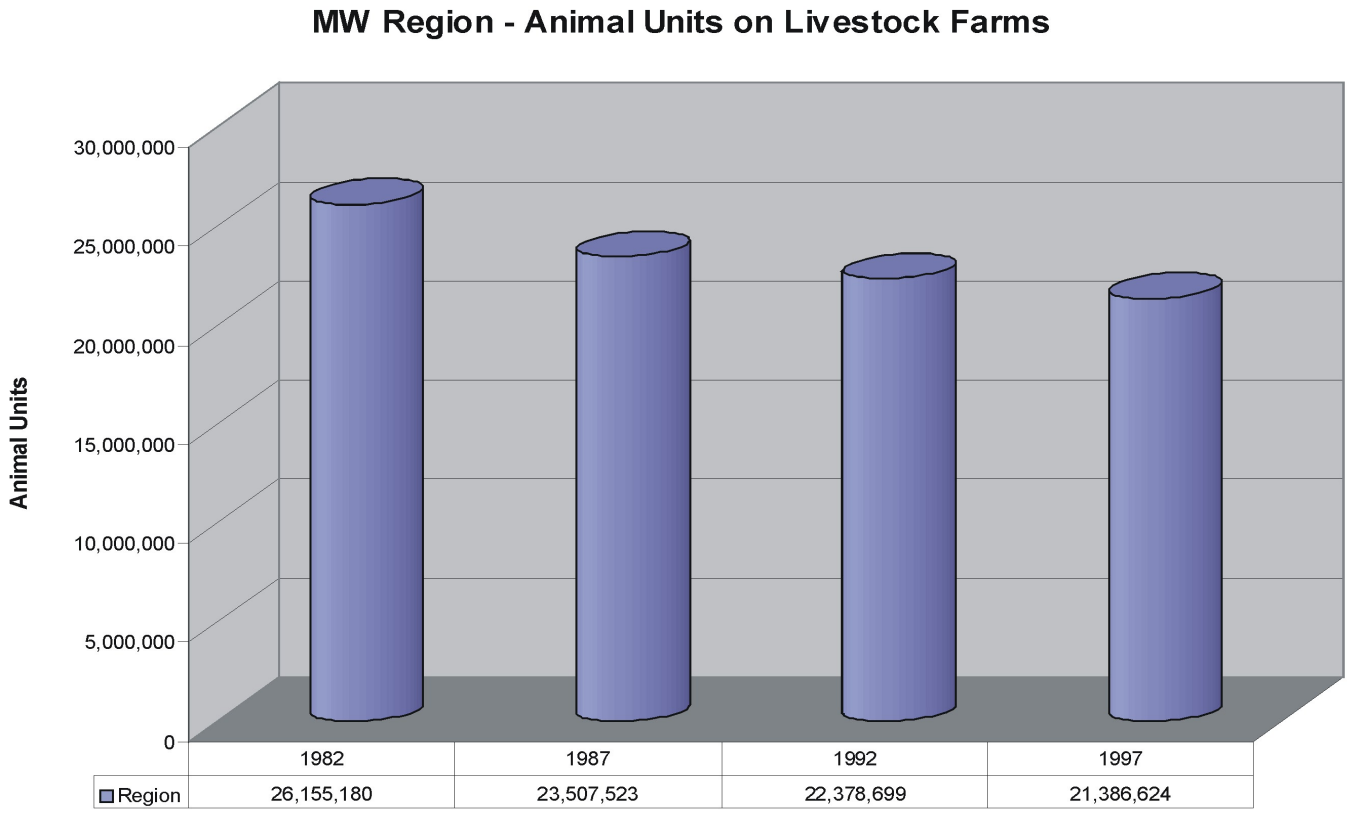


Figure 29

Source: NRCS Data Derived from Ag Census

Livestock facilities have grown in size and concentration. This has caused legitimate concerns and has increased the perception of fears about these facilities. Environmental concerns revolve around nutrients, pathogens, and odors. Manure management should not, however, be limited to storage and proper handling. The concentration of livestock production on a decreasing number of farms and into facilities of ever-increasing size creates real challenges for proper manure management.

Large livestock facilities may not have access to enough cropland to distribute their manure at agronomic rates. The concentration of confined livestock facilities is an issue when discussing proper manure management. In 1997, there were 12.1 million confined animal units within the region. These confined livestock were associated with 183,000 livestock operations. The number of livestock operations with confined livestock declined 39 percent from 1982 to 1997; whereas, the number of confined livestock only declined 12 percent for the same time period. (see figure 30)

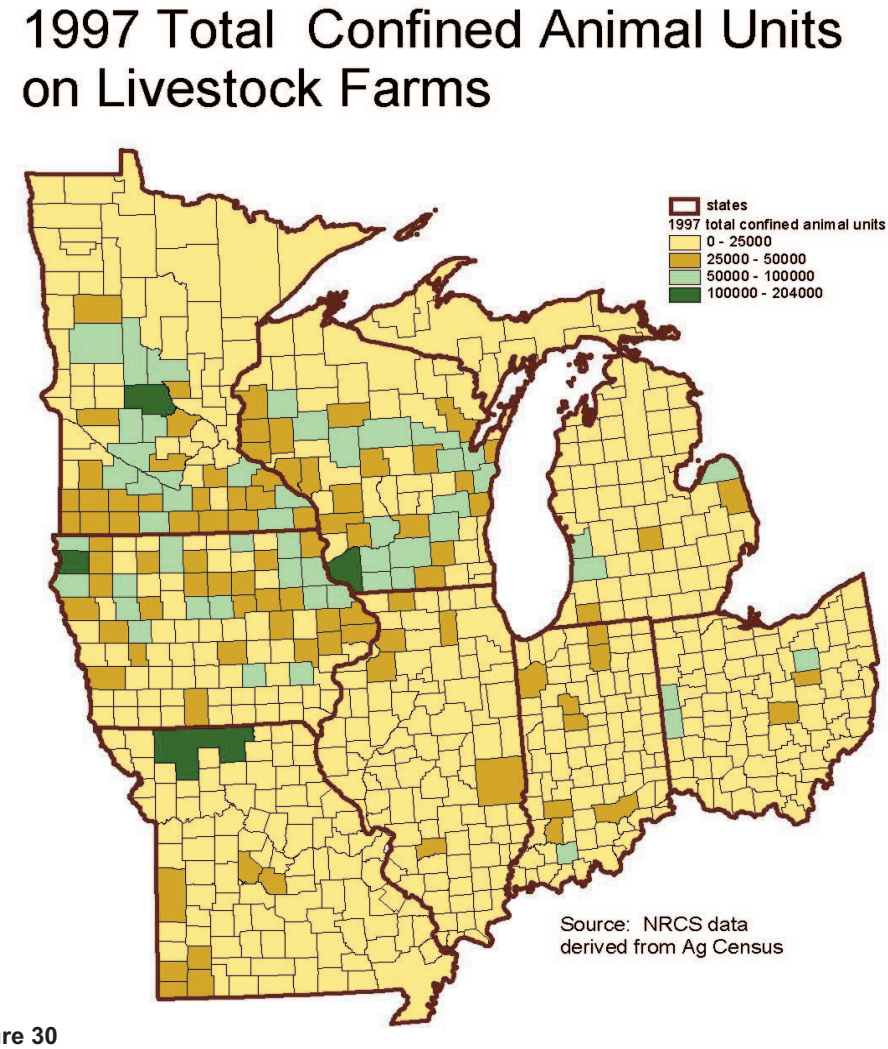


Figure 30

NRCS and their core conservation partners (State agencies, Conservation Districts, and RC&D) completed a detailed workload analysis (WLA 2001). Within this analysis, core conservation partners identified total conservation needs for county resource related work products. County conservation needs were developed from a variety of data sources including: ag census, NRI, state assessments, and county data. Conservation needs included estimates of numbers of animal waste management systems needed, planned, and applied in each county. These estimates are based on scientific data and knowledge at the local level. The data is being used by NRCS and partners to assess the magnitude of animal waste issues.

The Clean Water Action Plan of 1998 directed USDA and EPA to jointly implement an AFO strategy to address nutrient management issues from livestock manure. This strategy has been developed and for the vast majority of AFOs, voluntary efforts will be the principal approach in assisting livestock owners and operators in developing and implementing CNMPs. The goal of USDA/EPA is to help owners and operators take action to reduce and eliminate water pollution originating from AFOs. It is estimated that each CNMP requires approximately 160 hours of technical assistance to prepare and implement a typical plan with each livestock producer. It is estimated that planning and implementation of these plans within the region will require $117 million annually for the next 9 years. (see figure 31)

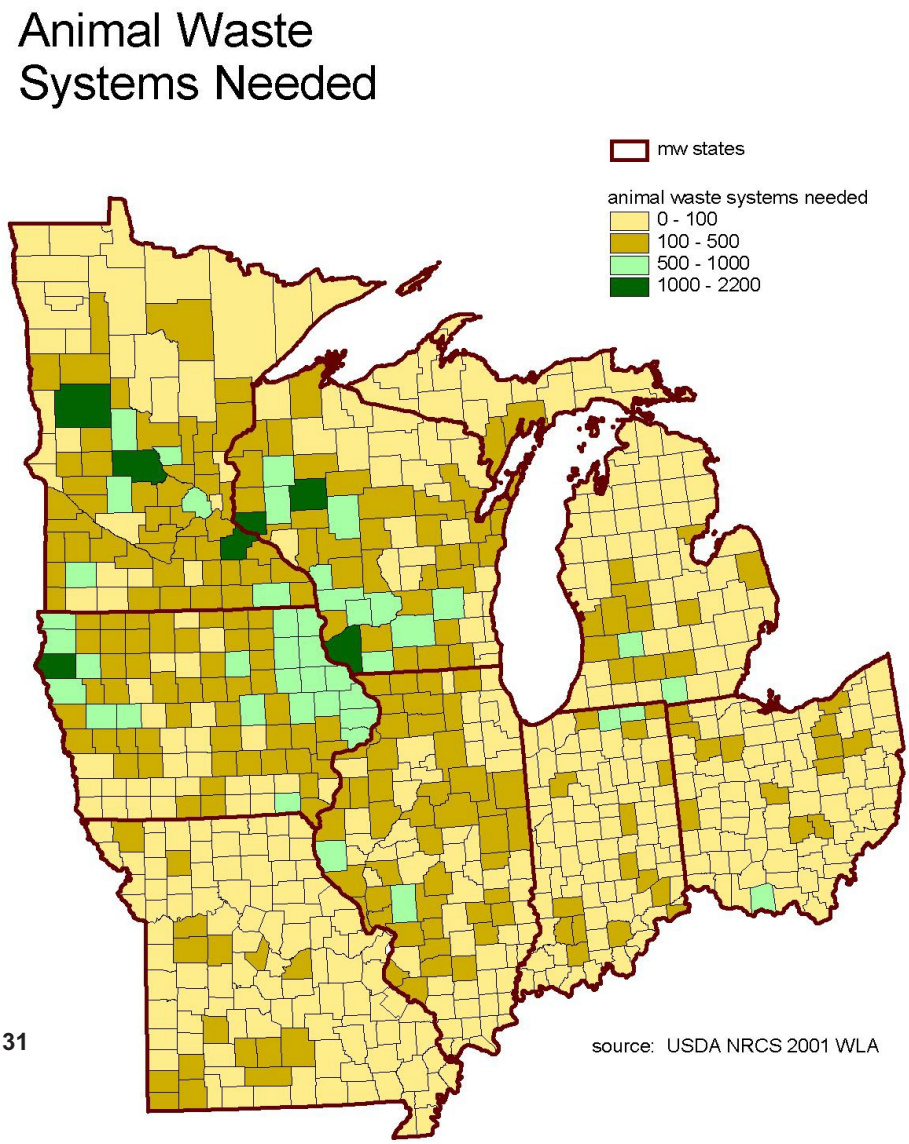
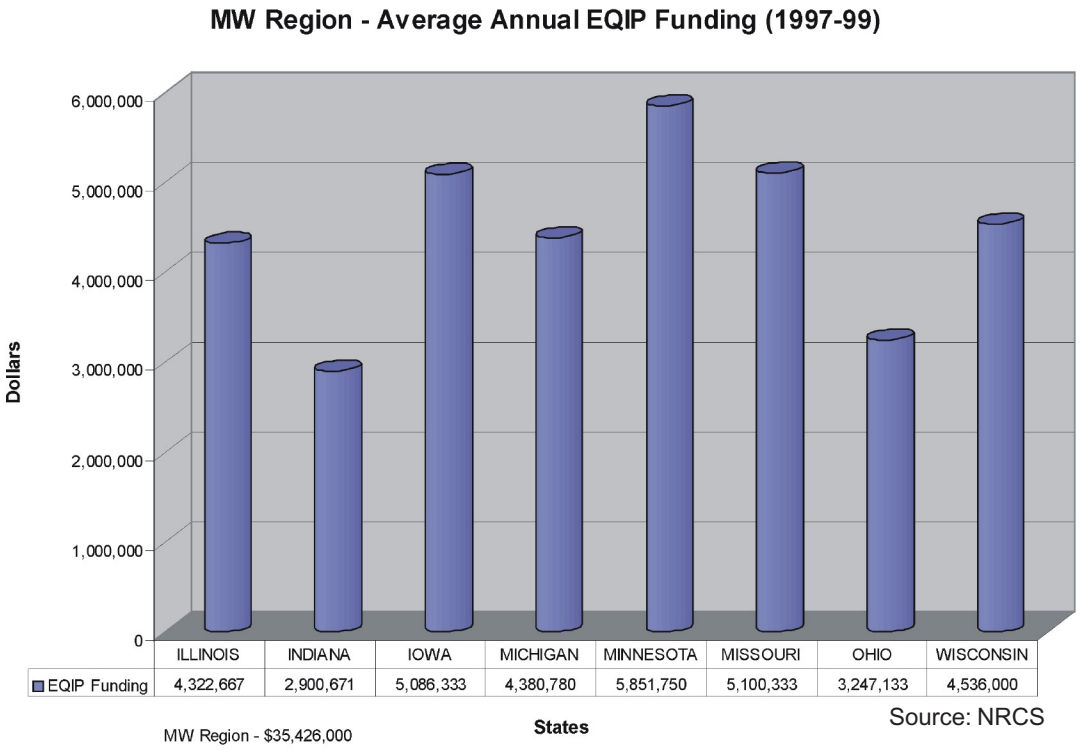


Figure 31

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) provides technical and financial assistance to landowners for the purpose of installing conservation practices to protect soil and water quality. At least 50 percent of financial assistance is targeted to livestock related natural resource problems and other locally identified conservation priorities. (see figure 32)

Figure 32



Summary of Animal Waste and Nutrient Management

Animal waste and nutrient management are critical issues in the Midwest Region. The concentration of livestock production, on a decreasing number of farms and into facilities of ever-increasing size, creates real challenges for proper manure management.

Animal Waste and Nutrient Management Facts

- The Clean Water Action Plan of 1998, directed USDA and EPA to jointly implement a strategy to minimize environmental and public health impacts from Animal Feeding Operations (AFOs).
- The Midwest Region has more than 108,500 AFOs needing Comprehensive Nutrient Management Plans (CNMPs), which represents 39 percent of the nation's needs.
- In 1997, the region had more than 12 million confined animal units associated with more than 183,000 livestock operations.
- Within the region, the number of confined livestock operations has declined 39 percent from 1982 to 1997; whereas, the number of confined livestock only declined 12 percent for the same period.
- The region will require more than $117 million annually for the next 9 years to complete all of the planning and implementation of the Comprehensive Nutrient Management Plans for the region's AFOs.

Loss of Farmland to Development

This section describes the conversion of farmland and other open space to development.

The USDA 1997 National Resources Inventory (NRI) shows an accelerated loss of farmland to development or non-agricultural uses in the Midwest Region. More than 1.9 million acres of the region's cropland, forestland, and other open space were converted to urban and other uses from 1992 to 1997. The average rate for conversion in 5 years (376,800 acres) is almost 1.5 times the rate of conversion during 1982 to 1992 (213,100 acres). More than 1.9 million of the acres converted to urban and built-up land between 1992 to 1997 were some of the region's best prime and unique farmlands. (see figure 33)

Urban sprawl and the loss of farmland are evident to anyone familiar with suburban America. Urban growth continues to impact the availability of land for agriculture. Demographers now predict a long-term and gradual dispersal of the United States population into smaller, less densely settled cities and towns. The 1997 NRI data shows that this trend has already started in the region. The loss of farmland is no longer centered predominately around major metropolitan areas, but is affecting growing numbers of small and mid-sized cities as well.

States with the highest acreage conversion rates in the region are Michigan and Ohio. Five states – Michigan, Ohio, Minnesota, Missouri, and Illinois – rank in the top-twenty list of states nationally. Figure 34 on the following page, provides data and comparisons for the loss of farmland to development for the 15-year period from 1982 to 1997.

The acreage converted to urban and built-up land during the 5-year period (1992-1997) translates into the region losing farmland at a rate of approximately 1,040 acres per day or 43 acres every hour.

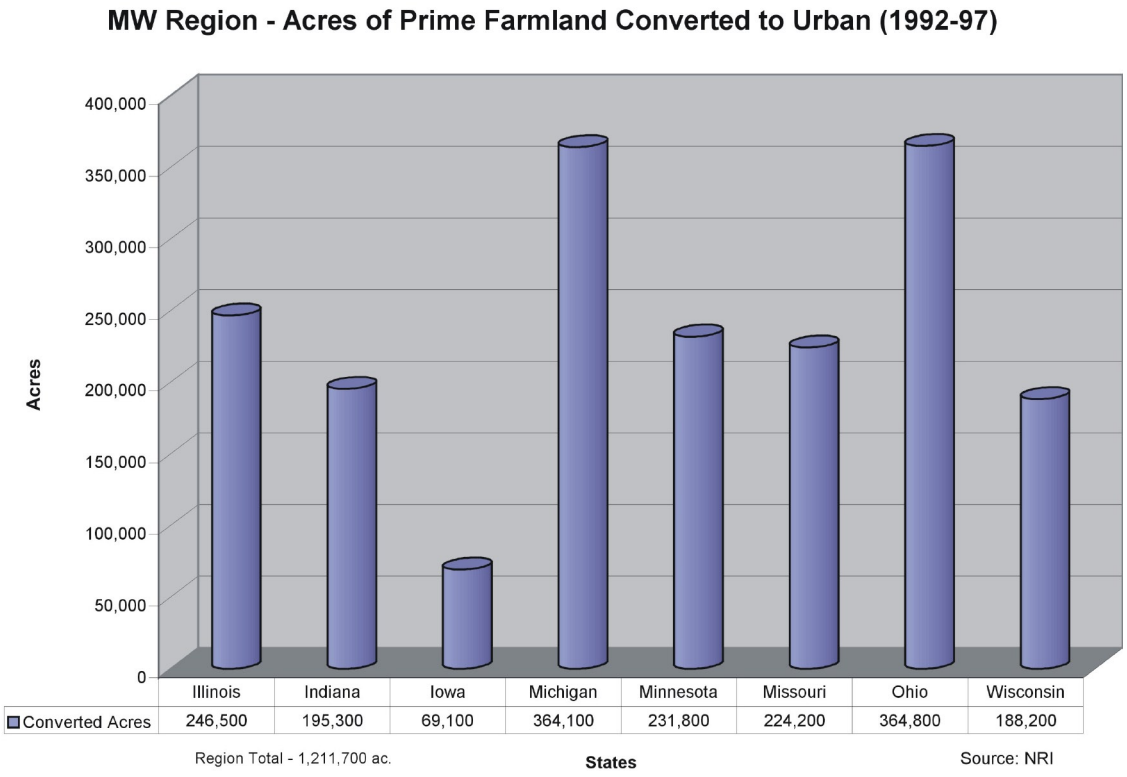


Figure 33

Loss of Farmland to Conversion

1992-1997 Rank	State	1992-1997 Change in Total land Developed (Acres)	1992-1997 Average Annual Conversion Rate (Acres)	1982-1992 Rank	1982-1992 Change in Total land Developed (Acres)	1982-1992 Average Annual Conversion Rate (Acres)
8	Ohio	364,800	73,000	8	463,700	46,400
9	Michigan	364,100	72,800	9	456,100	45,600
14	Illinois	246,500	49,300	19	245,800	24,600
17	Minnesota	231,800	46,400	21	233,800	23,400
18	Missouri	224,200	44,800	25	209,300	20,900
23	Indiana	195,300	39,100	23	230,300	23,000
24	Wisconsin	188,200	37,600	20	240,500	24,100
39	Iowa	69,100	13,800	45	50,800	5,100
Total	Regional	1,884,000	376,800		2,130,300	213,100
Total	National	11,217,000	2,243,400		13,788,900	1,378,900
Percent		16.80%	16.80%		15.50%	15.50%

Figure 34

Summary of Loss of Farmland to Development

The conversion of agricultural land to other uses results in the fragmentation of agricultural land, the loss of family farms, the disappearance of historic landscapes, and the loss of open spaces and places of scenic beauty. Once productive farmland is developed, it may be lost forever. In addition, the acreage that remains in agriculture is placed under greater environmental, economic, and social stresses.

Carbon Sequestration

This section introduces some causes of climate changes and solutions.

Changes in the Earth's climate and biosphere might be induced by the increasing concentrations of certain gases that have the potential to store heat. They are also referred to as greenhouse gases. Included in those greenhouse gases are carbon dioxide, methane, and nitrous oxide, which lend themselves to causing a warmer climate.

Photo:NOAA

Using carbon dioxide as an example, on a global scale, there is a net increase of 3.5 gigatons of carbon per year in the atmosphere as carbon cycles through the environment. (see figure 35)

In order to reduce the net increase, carbon must either be accumulated or reduce the emissions into the atmosphere.

Globally, agriculture contributes 20 percent of the greenhouse gases according to the Department of Energy. U.S. agricultural emissions represent 2 percent of the carbon equivalent emissions produced by the three greenhouse gases. Carbon dioxide released through plant and soil respiration, methane from decomposing animal waste, and nitrous dioxide from decomposing organic matter in soil are the three primary greenhouse gases produced by agriculture.

Planting trees, biofuels, and conservation tillage, in this order, have the potential of reducing emissions by over 15 percent in the U.S. (see figure 36 on the following page.)

Potential for Reduction

Carbon Dioxide

Carbon dioxide mitigation in agriculture includes reducing agricultural emissions, sequestering carbon in soils and trees, and utilizing bio-mass for the production of fuels.

Forestation

In the United States, the amount of forestland (737 million acres) has remained fairly constant over the past several decades, with an annual average fluctuation of about 0.1 percent per year. Improved forest management practices, planting trees, timber harvesting, and landuse have resulted in a net annual uptake of carbon.

Most of the timber that is harvested from U.S. forests is used in wood products that are eventually disposed of by landfills, rather than by incineration. Thus, significant quantities of harvested carbon are transferred to long-term storage pools (e.g., the timber used to construct a house) rather than immediately being released to the atmosphere (e.g., combustion as a fuel).

Idle cropland in the United States totaled about 56 million acres in 1995.

In the Midwest Region, NRCS has already assisted private landowners with planting over 260,000 acres of trees on idle CRP land.

If an area this size were planted in trees, and if an average weight of about 2.0 tons of carbon/acre, including increases in soil and litter carbon were stored each year, the total carbon uptake would be about 112 million metric tons of carbon per year (MMTC/yr), or about 8 percent of total U.S. carbon dioxide emissions in 1992.

Global Carbon Cycle

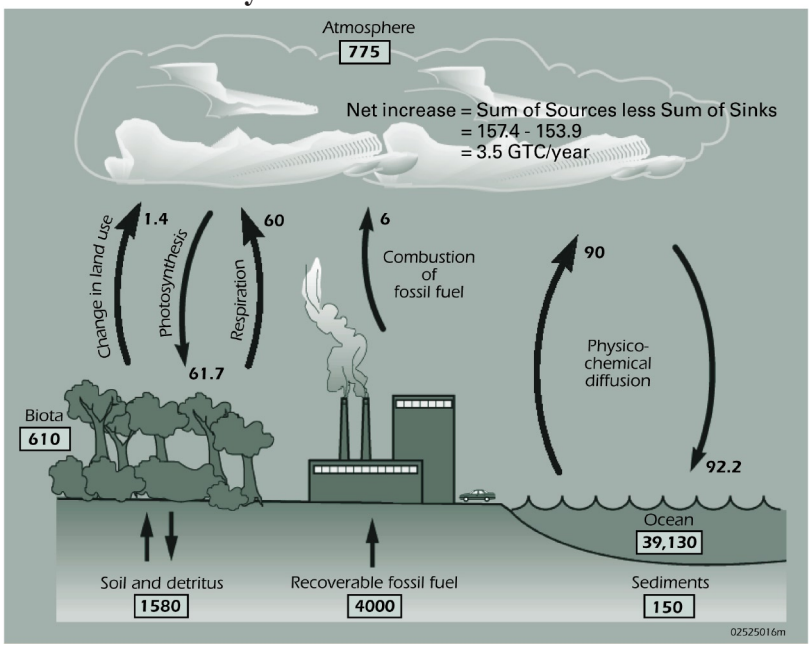


Figure 35. 1 Gigaton of Carbon (GTC) = 1000 Million Metric Tons of Carbon (MMTC) = 10 million of 100 metric tons railroad coal cars.

Biomass-Derived Fuels, Power, and Products

Another way to reduce carbon dioxide emissions from fossil fuels is to displace some of the carbon with carbon derived from renewable resources (i.e. trees, grass). Reports indicate that only a very small net atmospheric buildup occurs in biomass combustion (for example, power generation) when the biomass is grown for sustainability. This is because released carbon dioxide is largely compensated for by that withdrawn from the atmosphere during photosynthesis.

Displacing a unit of energy from gasoline, with a unit of energy from ethanol in light-duty vehicles, results in a 90 percent reduction in carbon emissions. Similar reductions can be expected from other biofuels, such as methanol and biodiesel.

Another way to determine the dedicated energy crop potential for the United States is as follows: dedicated energy crop yields of about 2 ton of carbon/acre/yr currently are achievable from good cropland. It is estimated that biomass yield per acre could increase four-fold from 2.5 tons/acre currently to 10 tons/acre with some crops (e.g., switchgrass). If the approximately 56 million acres of idle cropland in the United States in 1995 were used to plant energy crops, this would yield 113 MMTC/yr fossil fuel carbon offset, or about 6.3 percent of total 1997 U.S. carbon emissions (from carbon dioxide).

Biofuel crops can be incorporated into land conservation systems such as windbreaks and shelterbelts within agroecosystems. Idle or abandoned agricultural land can be converted to biofuel production. In addition, there is potential to increase the use of crop residues for biofuels, provided this is consistent with the maintenance of adequate levels of soil organic matter and erosion control.

Conservation Tillage and Residue Management

Historical losses of carbon observed in many soils were due, in part, to low soil productivity, soil erosion, inadequate fertilization, removal of crop residues and other biomass, and intensive tillage. In general, high residue production, perennial forage crops, elimination of bare fallow, and reduced tillage will promote sequestration of soil organic carbon.

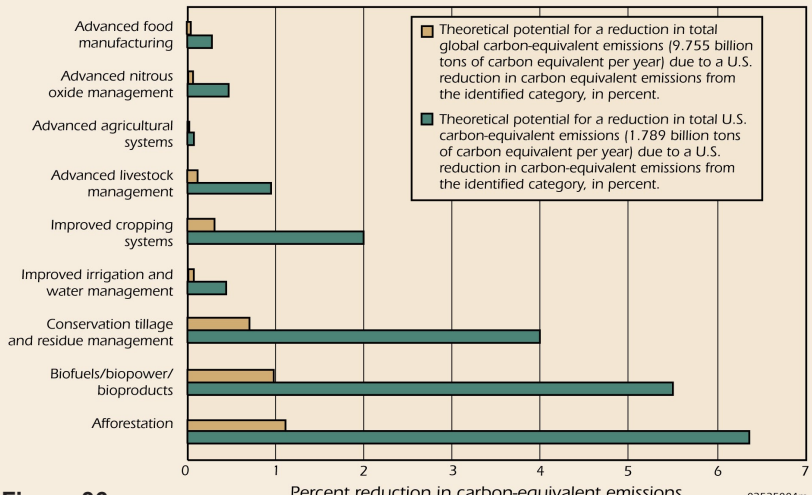


Figure 36

Maintaining and increasing soil organic matter (SOM) adds to soil fertility, water retention, and crop production. Conversion of large areas of cropland to conservation tillage, including no-till practices, during the next 30 years, could sequester all the carbon dioxide emitted from agricultural activities and up to 1 percent of today's fossil fuel emissions in the United States.

For the first time, U.S. farmers are planting more acres to crops and using more conservation tillage methods than traditional methods. In 1997, 37.3 percent of U.S. cropland was planted in no-till, ridge-till, and mulch-till systems compared to 36.5 percent conventionally tilled or plowed. The achievement represents a gain of 5 million acres.

Conservation tillage leaves at least 30 percent of the field covered with residue from previous crops after planting. For example, no-till planting has increased carbon content of soil from .2 to .4 tons per acre in one central Illinois farm over a 20-year period. Although no-till systems are setting the pace, reduced till is also on the rise. This method typically leaves 15 -30 percent residue on the land. Because U.S. cropland area is 13 percent of the world value, total carbon sequestration over 50 years in the United States would be 2,600 MMTC, or an average annual rate of 52 MMTC/yr.

Improved cropping systems represent current technologies that can be applied more effectively using existing techniques. Adoption of improved cropping systems has vast potential for increased carbon sequestration in agricultural lands already in use. An important component of best management practices (BMPs) is increasing the efficiency of fertilizer use.

Precision Agricultural Systems
For decades, agricultural managers have taken advantage of new technologies, including information technologies, that enabled better management decision making and improved economic efficiency of operations. The extent and rate of change now occurring in the development of information technologies have opened the way for significant change in crop production management and agricultural decision-making. Because agricultural information is so varied, the impact of new information-based technologies on greenhouse gas emissions is not yet certain.

Potential for Reduction

Methane

The most significant methane reduction opportunities for U.S. agriculture are in emissions from livestock. About one-third of the emissions reduction per unit of product are estimated to be from the dairy industry; whereas, two-thirds are from the beef industry.

Dairy Industry
Significant improvements in milk production per cow are anticipated in the dairy industry as the result of continued improvements in management and genetics. By increasing milk production per cow, methane emissions per unit of milk produced declines.

Beef Industry
Improvement in the quality of pastureland and grazing lands would yield reductions in methane emission through better digestion.

Animal Waste
Methane is produced during the anaerobic decomposition of the organic material in livestock and poultry manure. Liquid-based livestock manure systems, such as anaerobic lagoons, produce about 80 percent of the total methane. Methane recovery systems can collect the methane produced by liquid manure management systems so that the methane can be used as a fuel. With methane recovery systems, it is technically feasible to reduce total methane emissions from livestock manure by 80 percent. Although it is technically feasible for virtually all farms using liquid-based manure management systems, methane recovery systems are only profitable for some farms in warm climates. At these farms, it is profitable to collect the methane and use it to meet a portion of the farm's energy requirements.

Potential for Reduction

Nitrous Oxide

Soil Nitrogen
On a global scale, agricultural practices contribute approximately 70 percent of anthropogenic nitrous oxide emissions. These emissions occur primarily through decomposing organic matter in soil as it undergoes a series of oxidative and reductive processes, called nitrification and denitrification. However, it is the reductive process, denitrification, that is responsible for the primary loss of gaseous nitrogen compounds to the atmosphere. It is the loss of nitrogen as nitrous oxide that is of concern, because of the large global warming potential of nitrous oxide.

Human activities account for both direct and indirect nitrogen additions to soils. Direct additions occur through cropping practices, such as the application of synthetic nitrogen and organic fertilizers, production of nitrogen-fixing crops, cultivation of high organic soils, and through livestock waste management. Because interactions among the physical, chemical, and biological variables are complex; nitrous oxide fluxes from agricultural systems are highly variable in both time and space. Precision agriculture technologies could help reduce this variability.

Summary of Carbon Sequestration

Carbon sequestration in terrestrial ecosystems can be defined as the net removal of carbon dioxide from the atmosphere into long-lived pools of carbon. The USDA can take action to help reduce the emission of carbon and other greenhouse gases through a variety of measures. Forestation and conservation tillage systems are just two examples of what can be done by USDA to help offset the emissions of greenhouse gases.

Carbon Sequestration Facts

- Globally, agriculture contributes 20 percent of the greenhouse gases.
- Biomass yield per acre could increase four-fold from 2.5 tons/acre currently to 10 tons/acre with some agriculture crops; such as switchgrass, which would lead to carbon sequestration.
- Conversion of large areas of cropland to conservation tillage, during the next 30 years, could sequester all the carbon dioxide emitted from agricultural activities.
- In 1997, 37 percent of U.S. cropland was planted in no-till, ridge-till, and mulch-till systems compared to 36.5 percent conventionally tilled or plowed, which leads to additional carbon sequestration.
- The higher levels of carbon dioxide in the atmosphere are likely to enhance fertilization effects in plant growth and contribute to generally higher yields from global warming in the region.

Aging Watershed Dams

This section discusses the current status of aging watershed dams.

Since 1944, NRCS and local sponsors have been building floodwater-retarding dams primarily under the authority of Public Law-534 and Public Law-566. As a result of 240 small watershed projects being installed, more than 2,100 structures have been constructed in the Midwest Region. In the next 10 years, more than 200 floodwater-retarding structures in the region will reach the end of their 50-year evaluated life span. Many of these dams will need rehabilitation to ensure that they continue to contribute to clean water, environmental improvement, economic development, flood reduction, and in the development of an infrastructure on which many people and communities depend. (see figure 37)

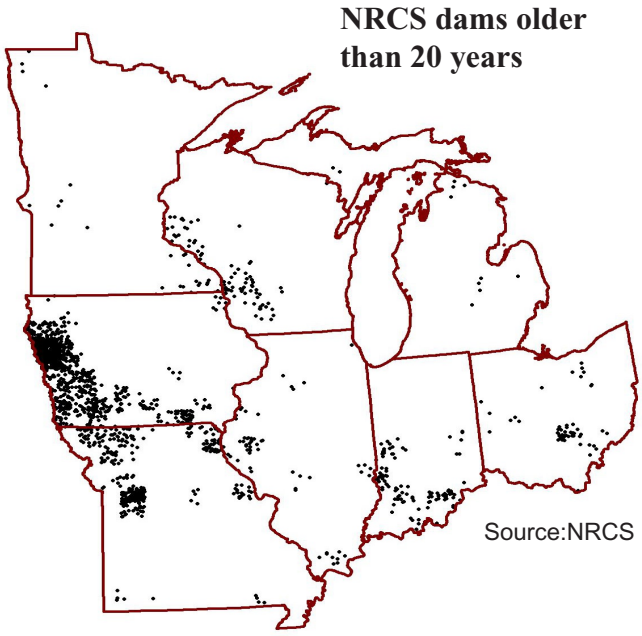


Figure 37

In 1998, it was estimated that these 2,100 floodwater-retarding dams generated more than $109 million in benefits. Without rehabilitation, many of these dams will no longer be able to protect communities and improve the health of watersheds by conserving natural resources. Failure of these dams could present an immediate threat to life, property, and health. The economic impact of a failure could be devastating to local communities. A recent survey indicated that NRCS would need an estimated $79 million to address rehabilitation needs on an estimated 700 floodwater-retarding dams within the region. Additional resources are needed to ensure that these floodwater-retarding structures continue to function and provide benefits.

Floodwater retarding dams have helped protect America's communities and natural resources for many years, but, like highways and houses, these dams need to be maintained and improved.

Photo: Barbara Jansen

Basins of National Importance in the Midwest Region

This chapter describes the two largest watershed basins located in the Midwest Region.

Introduction to the Basins

The Midwest Region encompasses portions of seven different two-digit hydrologic units (large river basins): Upper Mississippi River Basin, Great Lakes Basin, Ohio River Basin, Missouri River Basin, Souris-Red-Rainy Rivers Basin, Arkansas-White-Red Rivers Basin, and Lower Mississippi River Basin.

The Upper Mississippi River Basin is by far the largest in area. Over 120 million acres, or 41 percent of the region, is included in the Upper Mississippi River Basin. The watershed area contains major portions of Illinois, Iowa, Minnesota, Missouri, Wisconsin, and small portions of Indiana and Michigan.

The second largest in the region is the Great Lakes Basin. The basin is the largest fresh surface water system in the world. The watershed area includes portions of Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin in the region.

The Upper Mississippi River Basin and the Great Lakes Basin provide economic opportunities, transportation, and recreation for the Midwest Region.

Upper Mississippi River Basin

This section describes the structure of agricultural production and natural resource issues in the Upper Mississippi River Basin.

The Mississippi River is more than just a river; it is a unique resource and the best example of a multi-purpose river in the United States. In 1986, Congress designated the Upper Mississippi River System as both a nationally significant ecosystem and a nationally significant navigation system. It is the only inland river in the Uniteds States to have such a designation. Congress further recognized the system as producing a diversity of opportunities and experiences, and directed that it be administered and regulated in recognition of its many purposes.

The river's natural resources continue to support one of the most diverse and biologically productive wildlife populations in the world. The river hosts more than 400 different species, including the nation's most ancient lineage of fish, and provides temporary refuge for 40 percent of North America's migratory waterfowl.

The river's floodplain includes dense forests of maples, cottonwoods, and willow; which support bald eagles, herons, egrets, and double–crested cormorants. Recreation on and along the Upper Mississippi River attracts 12 million visitors annually, which is four times more than Yellowstone National Park. Commercial fishermen continue to harvest carp, buffalo, catfish, and freshwater drum.

Agricultural production is a major component to the economic livelihood of residents of the Upper Mississippi River Basin. In 1997, there were over 59 million acres (49 percent) of cultivated cropland in the basin, of which 72 percent was corn and soybeans. The basin also includes over 8.8 million animal units, which represents over 41 percent of the regional total and 10 percent of the national total.

In 1997, there were over 252,000 farms in the basin, which represented over 44 percent of the regional total. The number of farms in the basin continues to decline, with an estimated 14 percent reduction from 1987 to 1997. (see figures 38 and 39)

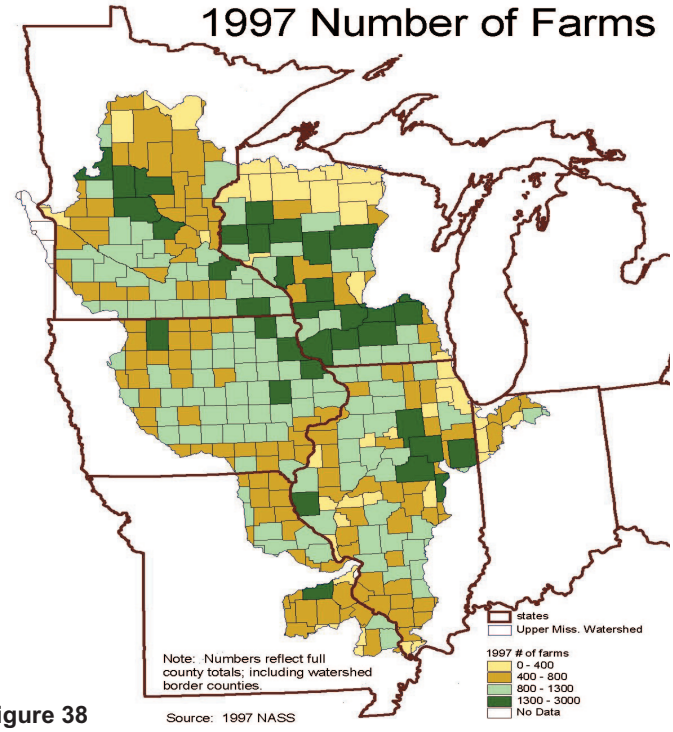


Figure 38

Upper Mississippi River Basin - 1997 Landuse/Cover

Landuse/cover	Upper Mississippi Basin	Percent
Cropland-cultivated	59,399,900	49.3%
Cropland-noncultivated	4,074,300	3.4%
Pastureland	10,870,600	9.0%
Forest land	24,470,000	20.3%
Minor land cover/uses	4,260,300	3.5%
Urban/Rural Transp.	8,164,900	6.8%
Water	3,608,500	3.0%
Federal Land	2,333,800	1.9%
CRP	3,312,500	2.7%
Total	120,494,800	100.0%

Figure 39

Natural Resource Issues and Concerns

A river basin as large and as diverse as the Upper Mississippi River Basin will have numerous natural resource concerns and challenges. This assessment will focus on three issues, all of which are impacted by agricultural production on private lands:

- Soil Erosion
- Animal Waste/Nutrient Management
- Wetlands

Soil Erosion

In 1997, over 22 percent of the 59 million acres of cultivated cropland within the Upper Mississippi River Basin were eroding at annual rates exceeding tolerable limits (T). About 10 percent of these acres are actually eroding at a rate twice the tolerable limits. The Workload Analysis (WLA 2001) indicated that over 39 million acres of cropland within the Upper Mississippi River Basin needed some type of conservation system application. Not only does this erosion lead to inefficiencies and lost income for farmers, but also has serious environmental impacts. Sediment and attached chemical particles are a serious threat to the quality of surface water within the basin.

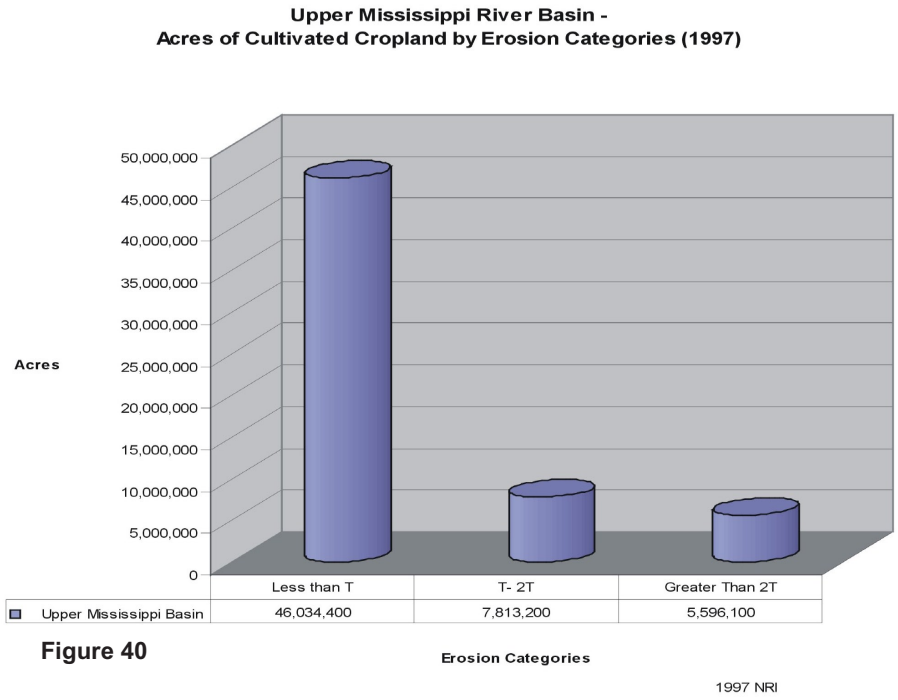


Figure 40

Erosion rates have declined significantly in the basin, since the early 1980s. Erosion, caused from water, has declined 37 percent from 1982 to 1997 and just over 11 percent from 1992 to 1997. Most erosion reduction is a direct result of farmers adopting conservation tillage practices and enrollment of highly sensitive lands in the CRP. (see figures 40 and 41)

Currently, in the Upper Mississippi River Basin, there are more than 3.3 million acres enrolled in CRP, which represents 46 percent of the region and 10 percent of the nation's CRP acreage. In 1998, the basin had over 22 million acres of cropland with a conservation tillage system, which represents more than 21 percent of the nation's acres of conservation tillage.

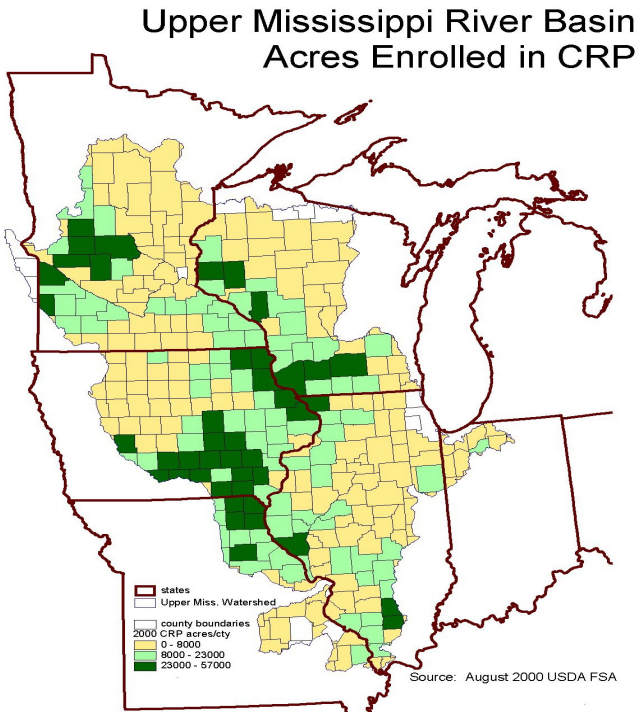


Figure 41

Animal Waste/Nutrient Management

The current level of nitrates is a real concern in the Upper Mississippi River Basin. The average annual nitrate concentration in the Mississippi River has doubled since 1950. This has contributed to hypoxic conditions in the Gulf of Mexico. Agricultural livestock producers have recognized their potential for contributing to this problem and have begun addressing animal waste issues, through the development of comprehensive nutrient management plans. It is estimated that approximately one-fourth of the animal waste systems needing some-type of planning assistance nationally is located in the basin. These waste systems will ensure adequate storage and utilization of manure from the more than 6.5 million confined livestock within the basin. (see figure 42)

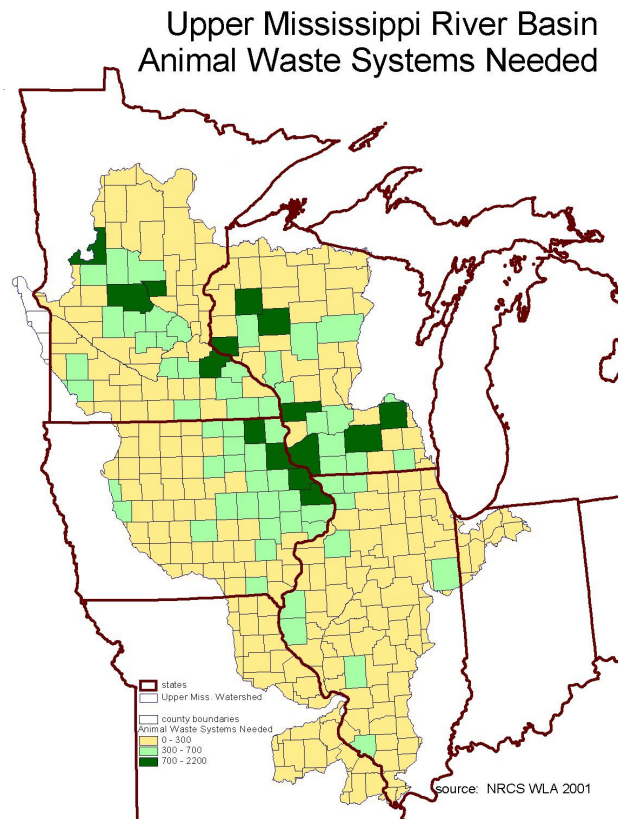


Figure 42

Wetlands

Wetlands are an important resource for the Upper Mississippi River Basin. Private landowners working with NRCS and other federal, state, and local agencies have placed a high priority in protecting, enhancing, and restoring wetlands in the basin. Wetlands are an important bridge between land and water with indistinct boundaries. Wetlands and their adjacent uplands provide public benefits that include:

- Improved water quality
- Enhanced habitat for wildlife
- Reduced soil erosion
- Reduced flooding

The Wetlands Reserve Program (WRP) has been very successful in the Upper Mississippi River Basin in protecting and restoring biologically rich wetlands. Over 122,000 acres of wetlands have been restored through the acquisition of nearly 1,200 easements. About one-half of the Region's WRP restored wetlands are located in the basin.

Private landowners are working with NRCS to protect and restore wetlands in the Upper Mississippi River Basin by enrolling over 122,000 acres in the Wetlands Reserve Program (WRP).

Partnership

While blessed with abundant and productive natural resources, the Basin is also fortunate to have a multitude of stakeholders interested in enhancing the quality of those natural resources. These include federal, state, tribal, nonprofits, and other organizations and groups who work diligently to further their separate missions as well as many jointly held goals regarding the quality of the Basin's natural resources and its people. A major legislative initiative, the Upper Mississippi River Basin Conservation Act of 2000, was introduced in the 106th Congress. This Act was aimed at understanding natural resource issues related to sediment and nutrient movement into the Basin's waterways. This has further stimulated partnership development toward helping shape policy for natural resources management in the Basin. This Act grew from a major Land Stewardship Initiative developed by St. Mary's University, in conjunction with several federal and state agencies and nonprofit groups. This Initiative continues to leverage additional discussion and support for improving natural resources management.

Summary of the Upper Mississippi River Basin

In a Nation endowed with magnificent water resources, the Upper Mississippi River is unparalleled. The 1,300-mile waterway directly links five states to the Gulf Coast export markets. The river system supports a tremendous range of uses. The Upper Mississippi River Basin consists of over 120 million acres, of which 98 percent is privately owned. It drains more than 41 percent of land in the Midwest Region. Agricultural production is a major component of the economic livelihood of residents of the basin. The Basin is also fortunate to have a multitude of stakeholders interested in enhancing the quality of those natural resources.

Upper Mississippi River Basin Facts

- Over 41 percent of the Midwest Region is included in the Upper Mississippi River Basin.
- In 1986, Congress designated the Upper Mississippi River System as both a nationally significant ecosystem and a nationally significant navigation system.
- In 1997, there were 59 million acres of cultivated cropland in the Upper Mississippi River Basin, or 49 percent of the basin landuse.
- In 1997, 44 percent of the Region's farms were located in the Upper Mississippi River Basin.
- Erosion in the basin, caused from water, has declined about 37 percent from 1982 to 1997.
- In 1997, 13.4 million acres (22 percent) of cultivated cropland, within the Upper Mississippi River Basin, was eroding at annual rates exceeding tolerable limits (T).
- Over 46 percent of the Region's and 10 percent of the nation's acres enrolled in CRP are in the Upper Mississippi River Basin.
- The average annual nitrate concentration in the Mississippi River has doubled since 1950.
- Approximately one-fourth (69,520) of the animal waste system needing some type of planning assistance nationally is located in the Upper Mississippi River Basin.
- Over 122,000 acres of wetlands have been restored through the acquisition of nearly 1,200 WRP easements within the Upper Mississippi River Basin.

Great Lakes Basin

This section describes the resource issues in the Great Lakes Basin.

The Great Lakes--Superior, Michigan, Huron, Erie, and Ontario--and their connecting channels form the largest fresh surface water system on earth. Covering more than 94,000 square miles and draining more than twice as much land, these freshwater seas hold an estimated 6 quadrillion gallons of water, about one-fifth of the world's fresh surface water supply and nine-tenths of the U.S. supply. If spread evenly across the contiguous 48 states, the lakes' water would be about 9.5 feet deep.

In spite of their large size, the Great Lakes are sensitive to a wide range of pollutants. The sources of pollution include losses of sediment, nutrients, and farm chemicals from agricultural lands, waste from cities, discharges from industrial areas, and leachate from disposal sites. The large surface area of the lakes also makes them vulnerable to direct atmospheric pollutants that fall with rain, snow, or dust on the lake surface.

Outflows from the Great Lakes are relatively small (less than 1 percent per year) in comparison with the total volume of water. Pollutants that enter the lakes; whether by direct discharge along the shores, through tributaries, from land use, or from the atmosphere, are retained in the system and become more concentrated with time. Also, pollutants remain in the system because of resuspension (or mixing back into the water) of sediment and cycling through biological food chains.

Because the watershed encompasses a large part of North America, physical characteristics such as climate, soils, and topography vary across the basin due to glaciation. To the north, the climate is cold and the terrain is dominated by a granite bedrock called the Canadian (or Laurentian) Shield, consisting of Precambrian rocks under a generally thin layer of acidic soils. Conifers dominate the northern forests.

In the southern areas of the basin, the climate is much warmer. The soils are deeper with layers or mixtures of clays, silts, sands, gravels, and boulders deposited as glacial drift or as glacial lake and river sediments. The lands are usually fertile and have been readily drained for agriculture. The original deciduous forests have given way to agriculture and sprawling urban development.

Photo: NOAA

The Great Lakes are the largest system of fresh surface water on the earth; however, they are sensitive to the effects of a wide range of pollutants.

Environmental History

While parts of the Great Lakes ecosystem have been changed to better suit the needs of humans, the unexpected consequences of many of the changes have only recently become apparent. Since about 1960, there has been an awakening to the magnitude of these changes and the harsher implications of some human activities.

The largest categories of impact are pollution, habitat loss, and exotic species. At first, the impact was localized. Agricultural development, forestry, and urbanization caused streams and shoreline marshes to become filled with silt and harbor areas to become septic. Domestic and industrial waste discharges, oil and chemical spills, and the effects of mining left some parts of the waterways unfit for water supply and recreation.

Waste-treatment solutions were adopted to treat biological pollutants that threatened the immediate health of populations. In some jurisdictions, regulations were passed to prevent unregulated dumping in the waterways. Even today, health problems from E. coli bacteria and cryptosporidium in drinking water threatens the viability of the region. Except in shallow bays and shoreline marshes, the Great Lakes were oligotrophic before European settlement and industrialization. Their size, depth, and the climate kept them continuously cool and clear. The lakes received small amounts of fertilizers such as phosphorus and nitrogen from decomposing organic material in runoff from forested lands. Small amounts of nitrogen and phosphorus also came from the atmosphere. These conditions have changed.

Temperatures of many tributaries have been increased by removal of vegetative shade cover, climate change, and some by thermal pollution. More importantly, the amounts of nutrients and organic material entering the lakes have increased with intensified urbanization and agriculture. Nutrient loading increased with the advent of phosphate detergents and inorganic fertilizers. Although controlled in most jurisdictions bordering the Great Lakes, phosphates in detergents continue to be a problem where they are not regulated.

Increased nutrients in the lakes stimulate the growth of green plants, including algae. The amount of plant growth increases rapidly in the same way that applying lawn fertilizers (nitrogen, phosphorus, and potassium) results in rapid, green growth. In the aquatic system, the plant life eventually dies, settles to the bottom, and decomposes. During decomposition, the organisms that break down the plants use up oxygen dissolved in the water near the bottom. With more growth, there is more material to be decomposed, and more consumption of oxygen. Under normal conditions, when nutrient loadings are low, dissolved oxygen levels are maintained by the diffusion of oxygen into water, by the mixing of currents and wave action, and by the oxygen production of photosynthesizing plants. (see figure 43)

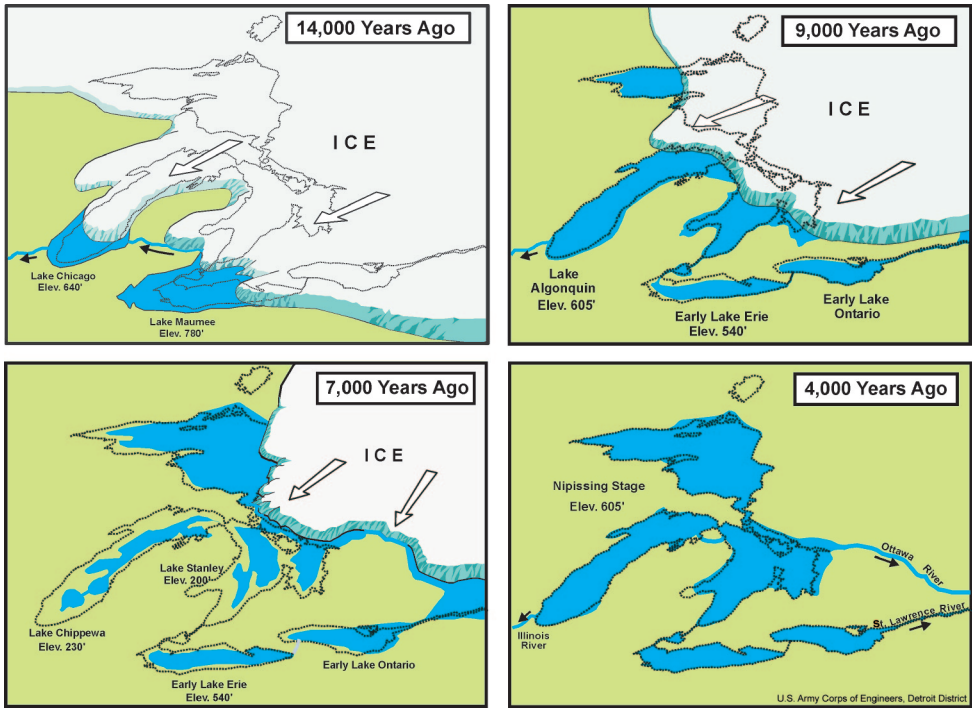


Figure 43

Natural Resource Issues and Concerns

A basin as large and as diverse as the Great Lakes Basin will have numerous natural resource concerns and challenges. This assessment will focus on three issues, all of which are impacted by agricultural production on private lands:

- Animal Waste/Nutrient Management
- Wetlands
- Biodiversity

Animal Waste/Nutrient Management

Animal waste and nutrient management are critical issues facing agricultural producers in the Great Lakes Basin. The potential for nitrates, from animal waste, impacting the Great Lakes has increased livestock producers' awareness for developing animal waste and nutrient management plans.

In 1997, there were an estimated 2.5 million animal units in the basin (within the Midwest Region). Estimates from NRCS and partners indicate that over 13,700 AFOs currently need a waste system or a nutrient management plan. This represents about 13 percent of the region's animal waste and nutrient management planning needs. In Fiscal Year 2000, NRCS and their partners assisted basin livestock producers to develop 453 animal waste system plans. (see figure 44). At the current rate, it will take more than 30 years for NRCS and partners to address the animal waste and nutrient management planning needs in the Great Lakes Basin.

Wetlands

Wetlands are a key category of habitat, within the basin, because of their importance to the aquatic plant and animal communities. Many natural wetlands have been filled in or drained for agriculture, urban uses, shoreline development, recreation, and resource extraction (peat mining). Losses have been particularly high in the southern portions of the basin. It is estimated, for example, that between 70 and 80 percent of the original wetlands of Southern Ontario have been lost since European settlement. In the U.S. portion of the basin, these losses range from 42 percent in Minnesota to 92 percent in Ohio. The loss of these lands poses special problems for hydrological processes and water quality because of the natural storage and cleansing functions of wetlands. Moreover, the loss makes it difficult to preserve and protect certain wildlife species that require wetlands for part or all of their life cycle.

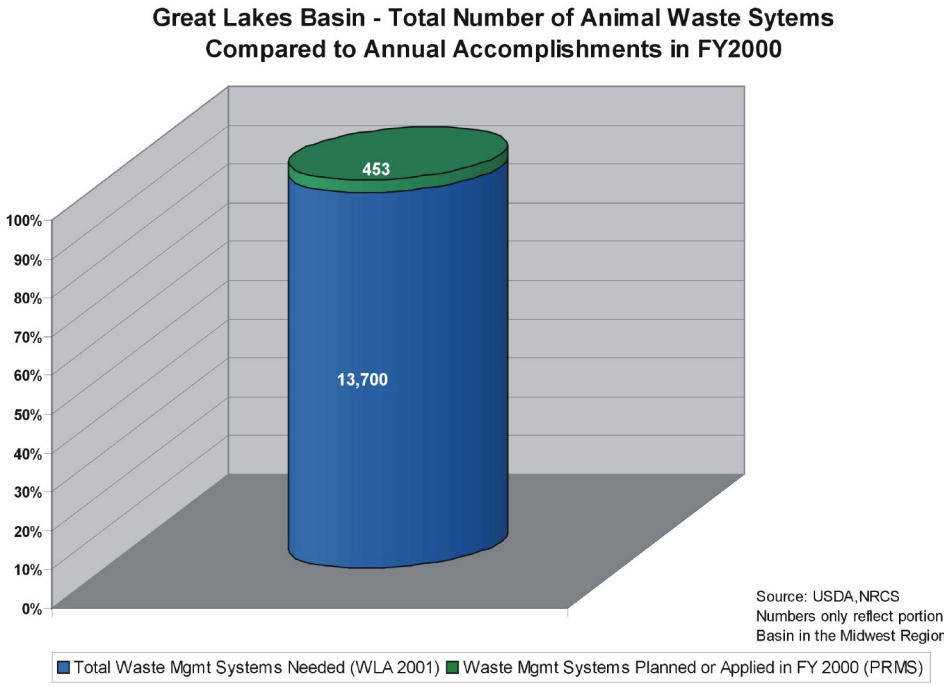


Figure 44

Biodiversity

Biodiversity refers to both the number of species and the genetic diversity within populations of each species. Some species have become extinct as a result of changes within the Great Lakes Basin and many others are being threatened with extinction or loss of important genetic diversity. Recovery of some highly visible species, such as eagles and cormorants, have been dramatic, but other less known species remain in danger.

The rapid, large-scale clearing of land for agriculture brought rapid changes to the ecosystem. Soils stripped of vegetation washed away to the lakes, tributaries, and silty deltas clogged and altered the flow of the rivers. Fish habitats and spawning areas were destroyed. Greater surface runoff led to increased seasonal fluctuations in water levels and the creation of more flood-prone lands along waterways.

Agricultural development has also contributed to Great Lakes pollution, chiefly in the form of eutrophication. Fertilizers that reach waterways in soils and runoff stimulate growth of algae and other water plants. The plants die and decay, depleting the oxygen in the water. Lack of oxygen leads to fish kills, and the character of the ecosystem changes as the original plants and animals give way to more pollution-tolerant species.

Conservation Successes

USDA programs, such as the Conservation Reserve Program and the Wetlands Reserve Program, have helped increase biodiversity by rehabilitating once farmed areas into wetlands, grasslands, and forests. Over 35,500 acres of wetlands have been restored in the Great Lakes Basin within the Midwest Region. Additionally, over 660,000 acres of fragile land in the basin has been protected through the utilization of CRP. (see figure 45)

The application of conservation buffer practices on private lands are aimed at controlling erosion and reducing runoff of soil, sediment, nutrients, and pesticides. As of October 1, 2000, approximately 22,300 acres of buffers have been established in the basin through the Continuos CRP and the CREP.

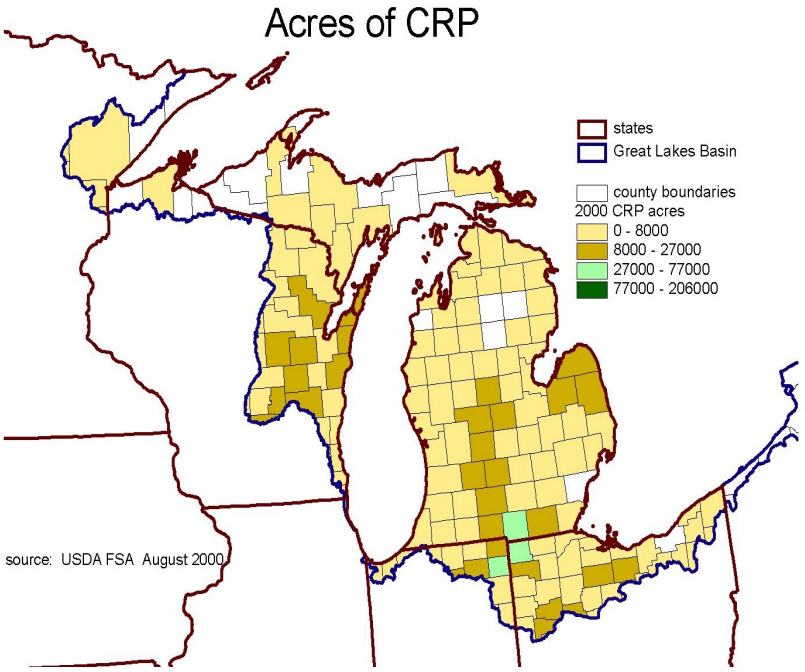


Figure 45

Summary of the Great Lakes Basin

The Great Lakes ecosystem greatly affects our way of life, as well as all aspects of the natural environment, from weather and climate, to wildlife and habitat. Yet, for all their size and power, the Great Lakes are fragile. In the past, this fragile nature was not recognized and the lakes were mistreated for economic gain. This placed the ecosystem under tremendous stress from human activities. Today, we understand that our health and our children's inheritance depend on our collective efforts to wisely manage our complex Great Lakes ecosystem.

Great Lakes Basin Facts

- The Great Lakes holds one-fifth of the world's fresh water supply.
- Spread across the contiguous 48 states, the lakes' water would be 9.5 feet deep.
- Outflow from the Great Lakes is less than one percent of the total water volume.
- In FY 2000, there were 453 animal waste systems planned in the Great Lakes Basin.
- Over 35,500 acres of wetlands have been restored through the implementation of the Wetlands Reserve Program in the Basin.
- Over 660,000 acres have been protected by their enrollment in the Conservation Reserve Program.
- The Great Lakes cover more than 94,000 square miles of total area.

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